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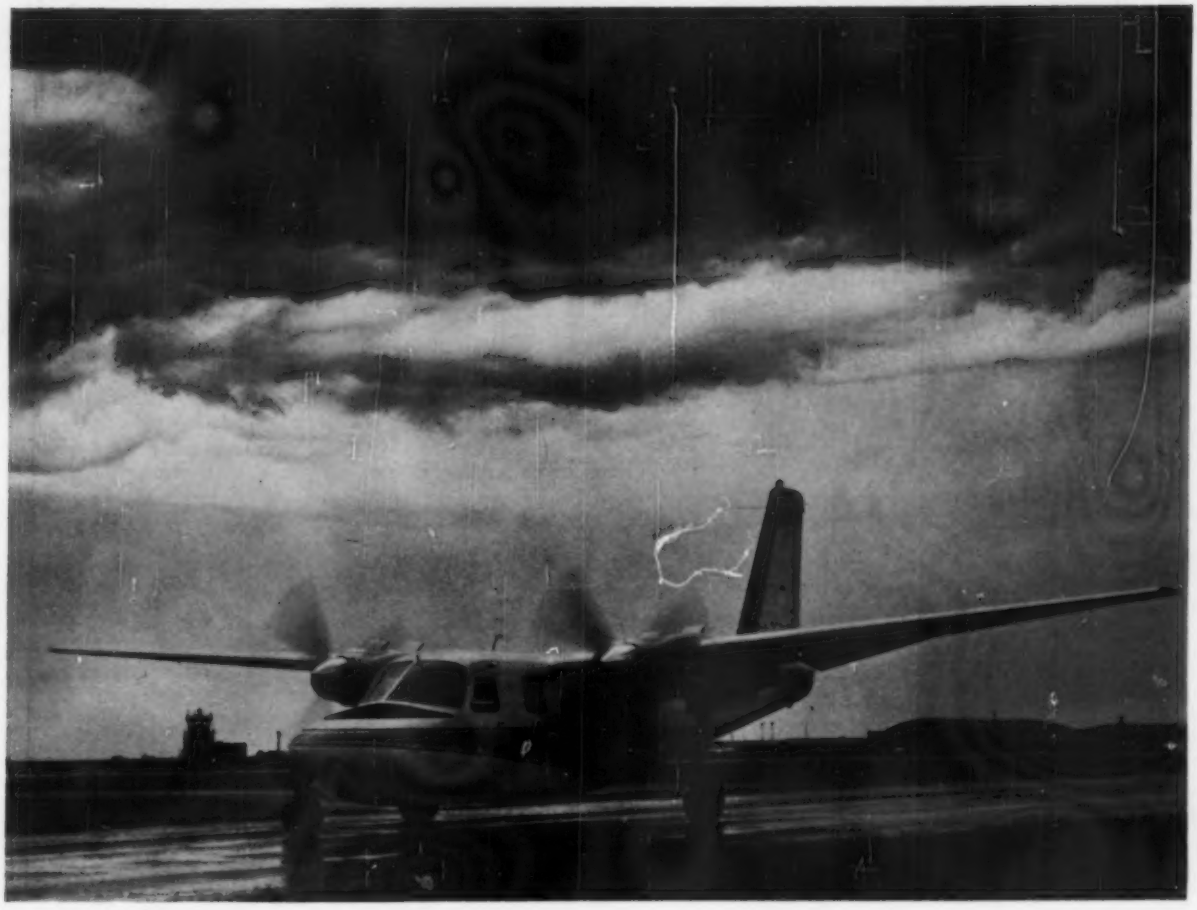

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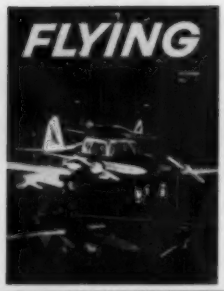

COVER: Coarse texture of a concrete apron takes on a glossy mirror finish reflecting the appropriate Christmas colors of tinsel and red in this water-drenched setting. The locale is Piper Aircraft's hangar at Lock Haven, Pa. The aircraft is the new Piper Apache H model. (Photo is by Anthony Linck.)

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NEXT MONTH marks the beginning of another year. A good time for new things. The right time to introduce two new features for our readers: a column for and about "week-end pilots," stressing fun of flying. Another covering FAA plans and developments. Both, we hope, reflecting the interests of those who turn to the air.

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WINGS and THINGS

FAA MEDICAL EXAMINERS are now participating in aircraft accident investigations. Approximately 250 volunteer aviation medical examiners in the Eastern Region (14 states, plus D.C.) have volunteered their services (gratis) to assist the CAB and FAA on all types of aircraft accidents. Their primary participation has been in area of small aircraft; their primary interest in human factors such as carbon monoxide poisoning, fatigue, hypoxia, etc.

JET-AGE FUELING. *At New York's Idlewild Airport some 170 fueling units (trucks), with 16 more on order, are pumping 1,500,000 gal. of fuel per day, 1,000,000 of this over a six-hour period. Turbine fuel comprises 90% of total, as against 60% 18 months ago. Refueling units have a 10,000 gal. capacity and total weight of 102,000 pounds. Pumping rate, two hoses per truck, is 300 gal/minute.*

THREE-LAYER AIRWAY SYSTEM, which became effective April 6, continues to cause pilot complications. Majority of pilots—transport, general aviation and military—cite the following: 1) Complicated ATC clearances and frequent "surprise" clearances have little resemblance to original flight plan; 2) When operating in intermediate structures, requests by ATC are frequently made to determine position on a low-altitude facility (requiring fast reference to additional chart); 3) radio facility charts are not compatable with ATC methods. Result: pilots electing to fly in low-altitude structure though their optimum altitude is in intermediate structure.

NEW FAA RATINGS *would include fixed wing, helicopter, glider and gyroplane, the latter rating (distinct from both helicopter and airplane) hinged to the recent type certification of Umbaugh's Model 18, gyroplane which embraces "jump takeoff."*

UPCOMING AIRCRAFT. Beech's new economy model, the about $11,000 Model 23, now flying with the 160-hp Lycoming 0-320-B2C engine. Piper's new Aztec, soon to be unveiled, will be fitted with six seats (standard); length has jumped 3 feet over the 1961 model. Baggage space includes 19 cubic feet (front) and 21 cubic feet (rear). Piper's 1962 Colt will hold same price range as the 1961 model ($4,995, basic).

KAMAN'S ENTRY *into the commercial helicopter field reportedly will embrace fibreglass blades, fuselage and skid gear (see* FLYING *for June). Civil models being considered include five-place aircraft with 130-mph cruise speed and 200-mile range; six-place helicopter with 150-mph cruise and 300-mile range. Prices would range from $90,000 to $325,000; operating costs would start at $75 per hour, based on 600 hours annually.*

TRAFFIC CONTROL suggestions voiced at recent Air Line Pilots Assn. Air Safety Forum included a full system for metropolitan areas, with airspace from "surface up to maybe 3,000 feet" reserved for "non-equipped" or small-airport traffic (covering from outer edge of designated terminal area to within 15-20 miles of metropolitan airport or airports involved).

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MAILBOX

EARLY CRAFTSMEN AT NORTH AMERICAN

I have frequently enjoyed reading your FLYING magazine. Your article "North American Aviation—Part I" in the September issue . . . intrigues me to the point of commenting editorially. With considerable pride, as a young structures engineer, I was a "plankholder" in the N.A.A. when "Dutch" Kindelberger, Lee Atwood and Stan Smithson really started N.A.A. . . . in 1934 in Baltimore, Md.

I concur with your remark that "Dutch" inherited many fine craftsmen, such as, Bob McCulloch, now chairman of the board of Ling-Temco-Vought, Inc., and Ralph Ruud, now president N.A.A., Inglewood. However, he also inherited a fine, hard-core technical staff, who had by their skill, capability and endurance survived many shakedowns in the rough 1929-1933 depression period in the predecessor companies of N.A.A., which were as I recall, Berliner-Joyce, General Aviation (Fokker Aircraft), Pittsburgh Metal Aircraft, Curtis-Caproni Co., Clark's Buffalo Aircraft Company; and, former Glenn Curtiss, Long Island, employees who had formed the original Berliner-Joyce Company. It was a combination of the excellent technical and manufacturing staff which made N.A.A. grow rapidly under Dutch's superb leadership, ably assisted by Lee and Stan.

To illustrate my point, some of these technical people are Lawrence Waite, now corporate vice-president-planning N.A.A.; Walter Burke now vice-president-general manager "Mercury", McDonnell; Carl (Red) Hanson formerly chief engineer N.A.A., Inglewood; Emerson Conlon formerly professor of aeronautical engineering at Michigan University, now associate director of research NASA; Elmer Bruhn now professor of aeronautical engineering, Purdue University; William Miller now professor of aeronautical engineering at Florida University; Edgar Schmued, now doing research work; Harry Nissen, now chief of design, Vought Astronautics; Earl P. Osborn and Thomas Hayes, now with Grumman Aircraft, and many others. Incidentally, Conlon, Burke, Waite and myself were classmates of the 1929 M.I.T. Aeronautical Engineering School.

The total history of North American Aviation, its predecessor companies and particularly its people, is a fascinating story spanning the "stick and wire" days of World War I through the space age of today.

I hope as a matter of policy you will continue such excellent stories, as the N.A.A. story, in your most interesting magazine.

J. R. CLARK
Vice President-General Manager
Vought Astronautics
Dallas, Texas.

USAF RESERVES

We were very pleased to see the article on the new USAF Reserve Recovery program (USAF Reserve and National Survival by Col. William Kimball). We are just beginning the operation of one of these squadrons, and therefore like to see news coverage as you have provided in the article in the September issue. . . . . We would like to request six additional copies for our reading room. . . .

I personally very much appreciate the thought provoking editorials by Mr. Gill Robb Wilson. . . . . I can't speak for all of the men in our unit about Mr. Wilson's opinions, but from what I know of his opinions, I'm with him.

MAJ. H. A. FURMAN, USAFR
Beloit, Wisc.

Your September issue of FLYING Magazine has an excellent article in it about the new USAF Reserve Program. . . . . Colonel William L. Kimball states clearly in layman's language the new mission of the USAF Reserve.

Reprints of this article would be good lead material in our recruiting effort and in our 'scrounging' drive to enlist the aid of appropriate civilian facilities . . . The 9513th Air Reserve Recovery Squadron would like reprints of this article for distribution. . . . . .

CAPT. LESTER M. ZINSER
Kalamazoo, Mich.

MILITARY VS. CIVILIAN FLYING

Please don't think this is a sob story... I'm not really mad at anybody, particularly FAA personnel who man the stations around the country, but as a military pilot who was exposed to "civilian-type" flying just once I can only say that I was amazed, shocked, angry and pleased with the often encountered "double standard." By that I mean, the manner in which I am treated as a military pilot and the treatment I received when flying a civilian aircraft along the same routes.

Last summer I rented a small aircraft in California and, with my family aboard, set out for West Virginia. Through habit I filed a flight plan. . . . That is where I first encountered the "double standard". . . . Many times I had hung around an airport trying to get my military "175" flight plan; . . . or sitting on the end of a runway waiting for clearance . . . as civilian aircraft were buzzing out. . . But now it was different. I had in my hand the little FAA flight plan form and my garb marked me as a week-end pilot. It seemed all the weather folks wanted to brief me on conditions en route and the controllers said, "Don't worry about a clearance, just give us a call when you're ready to go." . . . . Down the line, time for my first position report. Using the best in radio voice procedure to make the report, I was flabbergasted to hear. . . "Why yes, Mr. Lemon, we've been expecting you. How are all those kiddies liking the ride?" Still groping for words for a reply I was further astounded to hear, "Mr. Lemon you'll have ten knots better tail wind at 7,500 and the weather for your fuel stop is still CAVU." I could only mumble a "Roger" . . . What a change from when I call in "This is Army 12345!" I had gotten pretty used to the idea that the folks on the ground were mad at me for interrupting their cribbage game with a silly position report. And Weather for the fuel stop! Heavens! Be thankful you copied the altimeter setting and hope there was no change in the original forecast.

(Continued on page 6)

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MAILBOX

(Continued from page 4)

I arrived at the fuel stop . . . here come three attendants on the double. "Top it off, sir?" "The rest rooms are in that building". . . . Herding the kiddies back aboard, the aircraft is spic and span, completely serviced and invoice made out ready for signature. . . . The last time I came through here, in an Olive Drab airplane, it was "Do you fellows want something?" "What kind of credit cards do you have?"

Yes sir, this civilian flying is for me, but I often wonder about the difference in treatment. Could it be that people think the military pilot is so well trained that he doesn't need help? Are the operators afraid of the paper-work involved in servicing military aircraft? I don't know. I do know that this one trip opened my eyes to quite a few things. It was nice, too. Wish it could be that way all the time.

ROBERT E. LEMON
Capt., TC, USA
APO 358 San Francisco, Calif.

SKEPTICAL

. . . . In reading the "Newsreel" of your September issue I came across a very disturbing point. The caption accompanying the picture of the Mil-6 (USSR) helicopter reveals that this craft, powered by two shaft turbines rated at 4,650 shp each, is said to lift more than 30,000 pounds.

The American equivalent, the Sikorsky S-64, powered by two Pratt & Whitney JFTD12A-2 8,100 shp turbine engines will carry a useful load of 20,760 pounds.

The Russian ship, with a combined total horsepower of 9,300 shp, seemingly can transport a load that weighs 9,240 pounds more, in comparison with the Sikorsky which has a combined total shp of 16,200! Why?

ARTHUR DEDERICK
Washington, D.C.

● *True, the Mil-6 is powered by two gas turbine engines having a total of 9,300 shp. The combined power of the two Pratt & Whitney JFTD-12s of the Sikorsky is 8,100 military (maximum takeoff) hp, but their normal sea level rating is actually a total of 6,400 shp. Thus the Russian helicopter's engines develop 2,900 shp more than the Sikorsky's. The phrase "said to lift more than 30,000 pounds" was inserted in the caption because of a lack of confidence in the Soviet's veracity. There was no mention of the range with this load. Who knows? It may be only 50 miles. The Mil-6 established an official record for weight lifting 24,000 pounds back in 1958.*—ED

NORTH PERRY AIRPORT

We are very appreciative of the fine article concerning our North Perry Airport in your September issue. Since the writing of the article, twelve T-hangars have been completed with more scheduled within the next year.

To correct a couple of minor items, I would like to state that the field is owned and operated by the Broward County Department of Airports, along with Broward International at Fort Lauderdale. The field is not leased from the Navy.

Recent FAA Traffic Surveys indicate that aircraft movements are in the neighborhood of 125,000 per year, somewhat more than the 700 per month indicated in the article.

Thanks again for the nice job.

L. E. WAGENER, Director
Department of Airports
Broward County, Fla.

WIND IN MY PETTICOATS

The article in September FLYING, Wind in my Petticoats, by Betty Haesloop was very enjoyable. More articles of this type should be written and perhaps we can convince the male population that flying is for women too.

Ever since I can remember, my ambition has been to learn to fly and become an executive pilot. Six years ago part of this dream came true and I now hold a Commercial Pilot's License ASMEL, Flight Instructors Rating, and am now working on my Instrument Rating. But believe me it's a hard old road battling the business man afraid to fly with a woman pilot, jealous wives and the like. Fortunately I have an intelligent husband who approves of women in aviation and trusts their ability . . .

DONNA M. CLINE
Lawrenceville, Ill.

CLEAR AIR TURBULENCE

I have just finished reading your October issue and enjoyed especially Mr. Le Barron's fine article on C.A.T.

As a light-aircraft owner, I find the last section of the article dealing with mountain waves particularly interesting since this is the phenomenon we encounter frequently flying in British Columbia.

At the beginning of his article Mr. Le Barron mentions a bunch of B-29s "hovering over Japan at nearly zero airspeed." . . . I thought my own aircraft had good slow-flight characteristics, but these B-29s must really be something—or maybe Japanese air has a somewhat denser consistency.

All joking apart, more articles of this type would sharpen us private flyboys up considerably.

P. SCHOEN
Penticton, B.C., Canada

COURAGE HAS ITS OWN REWARDS

On behalf of Paul Rathje, I wish to thank you for the utmost kindness, consideration and assistance which you have accorded him. As you know, the letters and monetary assistance expressing a genuine desire to help Paul have certainly been heartwarming to say the least. Almost every letter urges him to continue and not quit.

Paul Rathje is rebuilding again, and he is personally answering every letter he has received. When the new buildings are complete and the field operating there will be a plaque on one wall (more if necessary) with the names of all who helped. . . . As yet he is still "shook" over the overwhelming response to the article in FLYING ("The Airport at Peotone," October issue, page 74), something he never expected . . .

IRWIN HIRSCH
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BRIEFINGS...

A memento of WW II, this Lockheed P-38 "Lightning" is now part of the USAF Museum at Wright-Patterson AFB, Ohio —a donation by the Bob Bean Aircraft Co., Hawthorne, Calif., and Kaufman Foundation, Philadelphia, Pa. Standing on the wing are Capt. Leslie E. Knapp, assigned to the base and Royal D. Frey,

chief of research at the museum now recalled to active duty with the USAF. Capt. Knapp is the last to fly an AF P-38. He flew this one up from Kelly AFB, Tex. Fry was a P-38 pilot with the 20th Fighter Group in England, WW II. The P-38 here carries the colors and markings of the 55th Fighter Squadron, 20th Fighter Group.

Uniform flight operations at all federally controlled airports in the nation go into effect December 26, 1961 under new FAA amendment to CAR 60. Under this rule, each airport with ATC tower service will have a surrounding traffic area, encompassing airspace five statute miles horizontally from the center and up to 2,000 feet above the surface, through which aircraft may not fly without ATC approval and may not enter without two-way radio communication. Where a tower is not under Federal operation, radio contact with this tower is required if aircraft is radio-equipped, but there is no requirement for the airplane to be so equipped for operation into such airports.

First report on Project SCAN's confidential near-collision incident reports to the Flight Safety Foundation shows a significant number of the incidents reported as occurring near VOR stations and at altitudes between 7,000 and 9,000 feet. With from 48 to 50 per cent of the private and business aircraft now using VOR as a primary navigation tool, there have been instances of aircraft converging on a particular VOR at almost the same time and altitude, thus creating a near-collision situation. Suggested conclusion: Pilots of these well-equipped planes are spending "more time on in-the-cockpit activities and less on outside-the-cockpit vigilance."

Early risers at Litchfield Beach in S. Carolina gazed in wonderment at the sight of an unoccupied, and seemingly abandoned, airplane resting on the sand in front of the Litchfield Inn. John Glymph, the inn's manager and Wallace Pate (right) looked the plane over seeking a clue, only to discover somewhat later that the pilot,

W. M. Jones of Southport, N.C. was having breakfast at the inn. A commercial fish spotter, Mr. Jones had been making an aerial survey of schools of Menhaden (valuable for fertilizer) out in the ocean; felt hunger pangs, spotted the Inn and came in for some ham and eggs and hominy grits.

Landing flares no longer are required on aircraft operating over water at night, according to recent FAA ruling. Operators may, however, continue to carry flares as optional equipment for emergency landings if they so desire. Flares on overland flights were abolished in 1958, FAA points out; and the military services stopped using them several years ago. Improvement of power plants and aircraft now makes flares unnecessary, FAA states.

AERIAL PROSPECTING—Prospective homesite buyers at Cape Coral, a 33,000-acre community at the mouth of the Caloosahatchee River on Florida's west coast near Ft. Myers are treated to an aerial view of the development by its builders, Gulf American Land Corp. Cape Coral operates a fleet of five Cessna Skyhawks; started with one, now owns four, leases one. In a four-month period one of its pilots made 2,966 flights, each with three passengers. At this rate, it is estimated that in a year's time 108,000 prospects from every state in the Union will have had a bird's-eye view of the property, 80 per cent of whom will be making their first flight.

Designed in the U.S.A. and built in Italy, a Lockheed 60 stops in at Lockheed Aircraft International at Los Angeles on its way from Milan for final delivery in Alaska and service with Alaska Airlines. The first of five of the new six-place planes ordered by Alaska Airlines, and built by

Aeronautica Macchi LAI's affiliate in Italy, the plane was flown the 7,250 miles from Milan to California via Shannon, Keflavik, Sondrestromfjord, Goose Bay, and Boston. The trans-Atlantic ferry flights are being made by the Aircraft Ferry Co. of Ft. Lauderdale, Fla.

National Aero Finance Co., Cessna Aircraft's wholly-owned subsidiary, has announced a new four-year financing plan for the single-engine Cessna models and rotary wing Skyhook. Contracts for the twin-engine Models 310 and Skyknight may be extended up to five years. It is now possible also to buy a five-year insurance policy to go along with the five-year finance contract.

A homebuilt twin-engine airplane of his own design and elbow grease is the proud possession of Delmar Ott of Napa, Calif. Ott, a mechanic with an average income and a private pilot with 350 hours, built the plane in his own yard, in his spare

time. With the help of Mrs. Ott, who is also a private pilot, the job took three years. Parents of two small daughters who have been in the air since babies, the Ott's also own another airplane—a Piper PA-16 which they bought as a wreck and rebuilt in their garage.

A bid to host the 1963 World Soaring Championships in the U.S. has been forwarded by the Soaring Society of America to the C.V.S.M. (Soaring Committee of the FAI), scheduled to meet in Paris, France, Nov. 25, 1961, to select the host nation for that year. Although the necessary outside support required to sponsor such an undertaking was not assured at October 31 deadline for submission of the bid, SSA expressed confidence that should the bid be accepted, full backing from America's soaring buffs would be forthcoming.

Unique addition to the adult night courses at Harriton High School in Rosemont, Pa., near Philadelphia, is an introductory course to private flying, capped by a demonstration flight, at no extra charge, by the course instructor. Classes are held on 10 consecutive Tuesdays, 8 to 9:30

(Continued on page 98)

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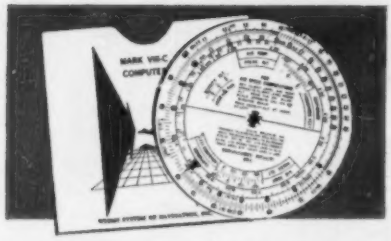

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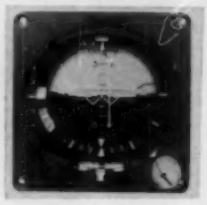
NEW PRODUCTS

Lear Inc.'s Instrument Division in Grand Rapids, Mich., has announced the Lear Model 4055G Flight Director-Attitude Indicator. By combining the two displays, pitch and roll is indicated on a two-tone moving sphere, and cross-pointers on the display give the "fly to" flight command information. A ball-type inclinometer presents turn-bank information. The amplifier package for this indicator is fully transistorized. It can be detached from the indicator case and mounted remotely, if conditions require.

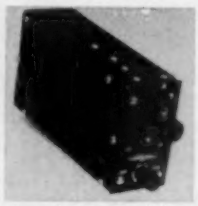


A new radome, specifically designed for the Cessna 310 airplane, now available from Chamberlain Aviation, Inc., Akron Municipal Airport, Akron, Ohio, accommodates either RCA or Collins lightweight radar with 12-inch sector scan antenna.

Designated Cair Part No. 2014X, the FAA-approved radome features X-band honeycomb sandwich construction. The complete assembly weighs 30 pounds; includes radome with built-in air scoop plus all accessories, necessary hardware and complete installation drawings.

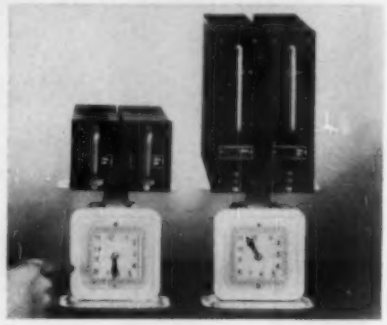
Low-cost audio-visual program entitled "Flying is Fun"—a 12-minute program in color in either 35 mm film-strip or 2" x 2" slides—now available from Aviation Industry Relations Co. 155 E. Ohio St., Chicago 11, is designed to generate interest in general aviation. Acceptable for presentation of all type groups, the program is said to be particularly effective as a sales tool to aid the fixed-base operator; ground and flight school operators. The price is $10 for 35 mm film-strip and record; and $12.50 for color slides and record.

The Min-Aire, a three-light marker beacon of new design, is now marketed by Livingston Electronics Corp., Livingston, N.J.



Completely transistorized, the receiver is self-contained, weighs 24 ounces and has a static drain of .005 amperes. Normal installation time requires about two man-hours. The three-light model costs $197, with an optional single-light unit for $147. Livingston's new five-year service guarantee, providing free factory service on both parts and labor (with the single exception of bulbs) goes with this product.

Forerunners of a complete new line of Solid State Systems airborne electronic equipment developed by Collins Radio are the all-transistorized 51Z-3 Marker Beacon and 51-V Glideslope Receiver pictured on left beside conventional tube-type equipment (right) which they will replace. The 2.9 pound 51Z-3 is 41 per cent lighter and draws 0.2 amps. of power as com-



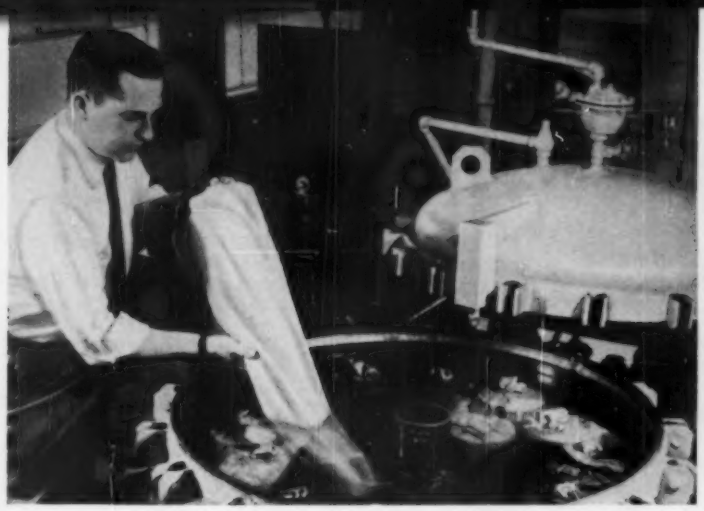
pared to 0.6 amps. for the older model. The 51V glideslope receiver, which like the marker beacon has no moving parts (its crystals are electrically switched), covers 20 channels, weighs 3.5 pounds. Its power consumption is 0.2 amps., or 80 per cent less than the 1.0 amps. for its predecessor. Combined, both units are about half the size, and weigh half as much, as their earlier counterparts.

Avitron, Inc., of Sunflower, Kan., has introduced the Airphone RT-17/b, a three-pound, three-ounce VHF Transceiver which it has had under development for the past two years.

A self-contained unit, the Airphone features built-in transistorized power supply, intercom, whistle-tuning, 17 channel transmitter, ignition noise limiter, copper chassis and shock-mounting. The RT-17/b, with four transmitter crystals is priced at $275, with additional crystals costing $6.50 each.

Non-magnetic cast-aluminum chocks, utilizing contoured face and spring connectors to secure wheels, are now available for light twin-engine planes through the smallest single-engine types; at $6.95 for a set of four, f.o.b., from Maran Mfg. Co., 23 North River St., Batavia, Ill. Constant

spring pressure provided by the connectors helps prevent accidental dislodgment and discourages pilferage. Its two-pound total weight makes the set a practical addition to a tie-down kit for many types of aircraft.



LOCKHEED JETSTAR—FIRST U. S. CORPORATE TURBOJET

Left: Shell engineer tests filter-separator at the AeroShell Turbine Fuel Equipment Laboratory – first in the U. S. **Right:** New Lockheed JetStar refuels. Shell sold over one billion gallons of aviation fuel last year.

Shell Research reports on 5 advances in fuels and lubricants and discloses how they improve aircraft performance

1. First non-ash additive oil for piston engine aircraft. AeroShell® Oil W is the first fully compounded additive oil ever *approved by every major piston engine manufacturer* in the U. S. AeroShell Oil W is the first piston engine oil that does not form harmful metallic-ash deposits.

It helps keep engines cleaner, extends periods between overhauls, can even lengthen engine life.

2. Shell grease lubricates X-15 as it sets world's speed record. Twenty-four greases were tested for use on the X-15 rocket plane. Only one – AeroShell Grease 5A® – passed all tests and was commercially available.

Today, AeroShell Grease 5A guards 23 vital control points in the X-15 as it sets new speed records for manned aircraft.

AeroShell Grease 5A is also recommended for commercial and private aircraft.

3. Full-scale gas turbine research lab. Shell Research built and operated one of the petroleum industry's earliest laboratories designed to investigate fuel performance in full-scale turbine engine combustion systems. This paid off in 1955 when the first airline introduced turbine aircraft. Shell was ready with the fuel.

Shell has the most extensive turbine fuel distribution network in the nation for general aviation and sold over a billion gallons of aviation fuel last year.

Today, Shell is the leading supplier of commercial aviation fuel in the U.S.

4. First turbine fuel equipment lab assures maximum cleanliness. Shell set up the first U.S. laboratory in the industry to study turbine fuel cleanliness. Its purpose: to assure Shell's ability to deliver uniformly clean fuel to your airplane.

As a result, today's Shell turbine fuel is of outstanding quality. You can buy it with absolute confidence.

Whatever plane you fly, wherever you fly it, Shell's experience in aircraft fuels and lubricants assures you of top performance.

5. Shell and fuels of the future. Shell has developed a special hydrocarbon fuel for Mach 3 flight. But the craft that will use it have yet to be perfected. When they are, Shell will be ready.

Shell rocket fuel—UMF®-C—is today powering the first-stage boosters of many of today's satellite vehicles.

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WHO and WHERE

James T. Pyle, FAA deputy administrator since 1959 and CAA (pre FAA) administrator from 1956 to 1958, recently resigned from FAA to become vice president of General Precision, Inc. a principal subsidiary with Link, Kearfott and Librascope divisions, of General Precision Equipment, Inc. Within his broad duties Pyle will serve on the various corporate committees. His headquarters are at 808 17th St., N.W., Washington, D.C.

Richard L. Cunningham, Indiana's director of Aeronautics, heads the National Assn. of State Aviation Officials for 1962, succeeding Clyde Barnett of California.

Paul F. Bikle again heads the Soaring Society of America. Bertha M. Ryan and Joseph Robertson also re-elected treasurer and secretary, respectively. Tom Page and John D. Ryan are new vice presidents and Maj. Gen. Kenneth P. McNaughton USAF (Ret) a new director-at-large.

Archie W. League took office October 1 as assistant administrator for the FAA Southwest Region with Robert V. Reynolds as deputy assistant administrator, at Fort Worth, Tex. headquarters.

John W. Winant of the Sprague Electric Co., was named 1962 president of the National Business Aircraft Association at annual meeting in Tulsa, Okla. He succeeds, B. J. Bergesen of Detroit.

Frank A. Boettger and Delbert L. Roskam former vice president/treasurer and vice president aircraft division, respectively, Cessna Aircraft, have been elevated to senior vice presidents. Roland D. Maier and Edward MacKenzie have joined the firm's rotary-wing division as sales and training specialists on the Skyhook.

Sam Frisella, sales manager of Skyways, Inc., and former regional sales manager of Cessna Aircraft, is named vice president/sales for Western Airways, Inc., retail airplane sales outlet for Skyways at Portland-Troutdale Airport, Ore.

Robert L. Gore in new position with Beech Aircraft is now manager of the firm's South Central Region covering Texas, Louisiana and Oklahoma. His headquarters remain in Wichita.

Stanley T. Richards is named public relations director, AC Spark Plug Div., GMC at Flint, Mich., replacing R. S. Johanson, resigned.

Arthur E. Abney, erstwhile director Illinois Department of Aeronautics, has joined American Airlines, Chicago office, as central director of state and community affairs. Since January of this year, he has been midwest consultant to the company for these activities.

Donald R. Humphries, John J. Griffin and John Myers are named to three key posts, in sales and service, at East Coast Aviation, Hanscom Field, Lexington, Mass.

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CESSNA ANNIVERSARY FLEET

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BESIDES MANY NEW ADVANCES—such as new 85-lb. increase in useful load plus a big increase in performance . . . brand-new interior and exterior stylings . . . new squared wing tips with faired navigation lights . . . new windshield sculpturing . . . new sharpened prop spinner and wheel-speed fairings—Cessna's Skylark offers the most complete equipment in its price class.

STANDARD EQUIPMENT includes constant-speed propeller . . . over-all paint . . . wheel-speed fairings . . . landing and taxi lights . . . navigation light flasher . . . push-button starter . . . gyros and vacuum system . . . turn-and-bank indicator . . . rate-of-climb indicator . . . sensitive altimeter . . . electric clock . . . and many, many more features. Complete for $14,125.

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HAVE YOU READ?

By JAMES F. SUNDERMAN

BY THE SEAT OF MY PANTS: A PILOT'S PROGRESS FROM 1917 to 1930, by Dean C. Smith (Little, Brown, 34 Beacon St., Boston 6, Mass., $4.50).

Here is a book that opens a new vista of aviation fact and lore. Dean Smith, well known to many in aviation circles, transcribes a part of his flying life, from enlistment in the Army Air Corps in 1917 through his service on the first Byrd Antarctic Expedition to the South Pole, 1928.

Old timers will find Smith's reminiscing about the Jennys in which he first trained at Kelly Field and later instructed in at Scott and Ebbets Field, Lonoke, Arkansas, to be a nostalgic, vivid flashback.

In 1919 Smith resigned his reserve commission journeyed to New York and for nearly a decade joined the group of ex-Army and civilian flyers who spread aviation to the grass roots of America.

He deftly exposes a highly critical attitude toward the first Byrd Antarctic Expedition in which he participated as a pilot, and which he calls a "business enterprise, a private venture promoted, organized and operated by Commander Byrd for his own objectives . . . not a scientific knowledge-seeking venture as we have come to expect of a government enterprise. . . ." One can only wonder what lies between these lines, or what happened to Smith's private diary which mysteriously disappeared from his trunk en route home from Antarctica.

TRIUMPH: THE INCREDIBLE SAGA OF THE FIRST TRANSATLANTIC FLIGHT, by Hy Stierman and Glenn D. Kittler (Harper, 49 E. 33rd St., New York 16, N.Y., $4.50).

It was only a brief few years after Kitty Hawk that Naval air pioneers bridged the Atlantic in a flight that made history. Three Navy-Curtis (NC) flying boats lifted from the sound at Rockaway Beach, New York on May 18, 1919, destination Europe. The plan was daring. The execution of it was plagued with adventure, mishap and disaster. Scheduled stops included Halifax, Nova Scotia, Trepassey, Newfoundland, the Azores, Portugal. The NC-4, commanded by Lt. Commander Read touched down at Plymouth, England on May 31, 1919. Ironically, it was Reed's craft which was forced down at sea on the first leg and continued after making repairs while bobbing in 10-foot swells.

The NC-1 landed at sea near Flores, Azores, to verify its position and sank after being buffeted for six hours by rough seas. The crew was picked up by the Greek ship, Ionia. The NC-3 landed for the same reasons in the same area. It could not take off again because of heavy seas and taxied for three days, finally reaching Ponta Delgada, Azores.

Indeed it was an "incredible saga" as the authors call it, one which young and old today will find inspiring.

HEROINES OF THE SKY, by Hervé Lauwick, translated from French by James Cleugh (Frederick Muller, London, $5.00, distributed by Sportshelf, P. O. Box 634, New Rochelle, N.Y.).

Right or wrong, air literature deals sparingly with women flyers. This French original presents descriptive glimpses into the aerial activities of 12 well known aviatrix's, German, English, French, and three Americans—Jackie Cochran, Amelia Earhart, and Anne Lindbergh. A chapter on the very early female pioneers credits the gals who braved the sky in balloons—including Madam Blanchard, whose efforts to make a living by spectacular balloon ascents over Paris led to her fiery death on 9 July 1918 when the hydrogen-filled gas bag was ignited by a string of exploding firecrackers that strung from the gondola to the ground.

AIR BOMBARDMENT: THE STORY OF ITS DEVELOPMENT, by Air Marshal Sir Robert Saundby (RAF, Retired) (Harper, 49 E. 33rd St., New York 16, N.Y., $5).

Life-long student and practitioner of military air tactics and strategy here traces the evolution of aerial bombardment from its uses in WW I, through the great strategic campaigns of WW II, its more limited employment in Korea, to the A and H Weapon equipped bombers and missiles.

The large share of the book is devoted to the strategic offensives of WW II, both American and British, while emphasis throughout is on RAF experiences.

Few will argue with Saundby that strategic air has added a new dimension to military operations. There are many, however, who will take issue with him on the validity of the concept itself, and dispute his claims on the contribution air bombardment made to winning WW II.

It is the danger of this military conservatism in civil and government circles which make books such as this one a must for all serious minded readers.

BUSH FLYING IN ALASKA, by Charles Coombs (Morrow, 425 Fourth Ave., New York, N.Y., $2.95).

Well-known aviation writer Charles Coombs here combines a simple flowing style with the drawings of Morgan Henninger to tell the fascinating story of all types of bush flying in our newest state—from air rescue to passenger and cargo transport. It is an intriguing, informative volume aimed at the 10- to 14-year-old, packed with facts and air lore.

If you have trouble securing books reviewed here, send payment in check or money order to AEROSPACE BOOK CLUB, 7801 Old Georgetown Road, Washington 14, D.C. Your books will be sent postpaid.

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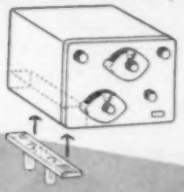

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All omni and localizer channels **plus 10 channel Glideslope receiver.** Crystal controlled. 6½" x 2⅜" panel space, weight 4½ pounds, price (14V) $825.

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This new addition to the *King Plan for Radio System Progression* adds ILS utility to the King KX-100 System without adding to space requirements. The entire unit is panel mounted (6½" x 5¼" face plate) and weighs only 9 pounds including a separately mounted, transistorized power supply (14V or 28V). You get all this for only **$1495.** (14V)

COMM — 90 channel crystal controlled Transceiver (118.0 to 126.9 mc inclusive), *all the channels you will ever need to operate in any terminal area* in the U.S. 10 watt transmitter power with receiver sensitivity to match.

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EASY INSTALLATION! The KX-110 is the simplest and easiest to install of all COMM/VOR/ILS packages. (Almost plug-in, if you now have a KX-100.)

And a Matching
Omni
Localizer
Glideslope
Converter
Indicator

The KING KI-210

Airline accuracy, reliability. Paired with the King KX-110 or KN50, gives you exceptional reception range on omni; switches automatically to localizer *and* Glideslope when the correct localizer frequency is tuned. Your instrument breakthroughs will be perfect centerline . . . missed approaches are obsolete with the KX-110/KI-210 System.

Size—Standard Instrument 3¼" x 3¼", 10" deep.
Weight—only 2½ pounds.
Price—only $995.00.

For *complete* information and demonstration of the King KX-110 and KI-210 see your King Dealer. Write direct to King Radio Corp., if you do not know his name and location. Ask also about the new KN-50 NAV Receiver with built-in Glideslope receiver.

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The Point of No Return

GILL ROBB WILSON
Publisher

LONELINESS is a matter of which airmen have some experience. In fact, a certain capacity to endure loneliness is requisite to the character fitness of men aloft. First solo is indoctrination. Cruise in the solitudes above the white nothingness leaves its indelible marks—and how much more this will be true as journeys are extended into space.

Yet this is a physical loneliness and, in the order of things, ends with return to the good earth and its familiar surroundings.

Perhaps, however, it prepares us somewhat to pity the plight of those who are lonely beyond the point of no return—the spiritually lonely, the tragic Godless.

Advent of the winter solstice with its national Thanksgiving and subsequent holy days, emblematic of the long struggle of mankind upward, prompts me to contemplate how blessed are the free and the worshipful even in the midst of wars and rumors of war.

In contrast to them to whom prayer is treason, conscience weakness and good will a tool of cupidity, we know a peace that is indestructible by conquest, immutable amidst the vagaries of history. I can understand how those isolated from heritage of the spirit become mad from frustrated instinct.

Perhaps here lies the explanation of the inhumanities which we witness—the treacheries, the massacres, the enslavements, the shoe poundings—madnesses beyond the pale of civilized behavior resulting from unendurable spiritual loneliness.

But however that may be, I make the point that we who are free and reverent of the Creator have no cause to resent that we must defend our freedom and faith when we contemplate in contrast those who have no freedom to defend and no faith to profess.

Indeed should we not be pondering the thesis that we as a people "have been called to the kingdom for such a time as this"—that as a nation we have been providentially nurtured against this day when in global dimensions it would be tested whether the objective of society was the emergence or submergence of man as a spiritual creature. Our political and institutional origins constituted a breakthrough in behalf of the dignity of the individual. The integrity of that concept has been tested in civil and foreign war—proclaimed as gospel by untold millions of immigrants—been fruitful in relief beyond computation to the underprivileged and ravished of the world. Certainly we are not blameless before the bar of enternal justice, but just as certainly our "manifest destiny" has been providential to civilization.

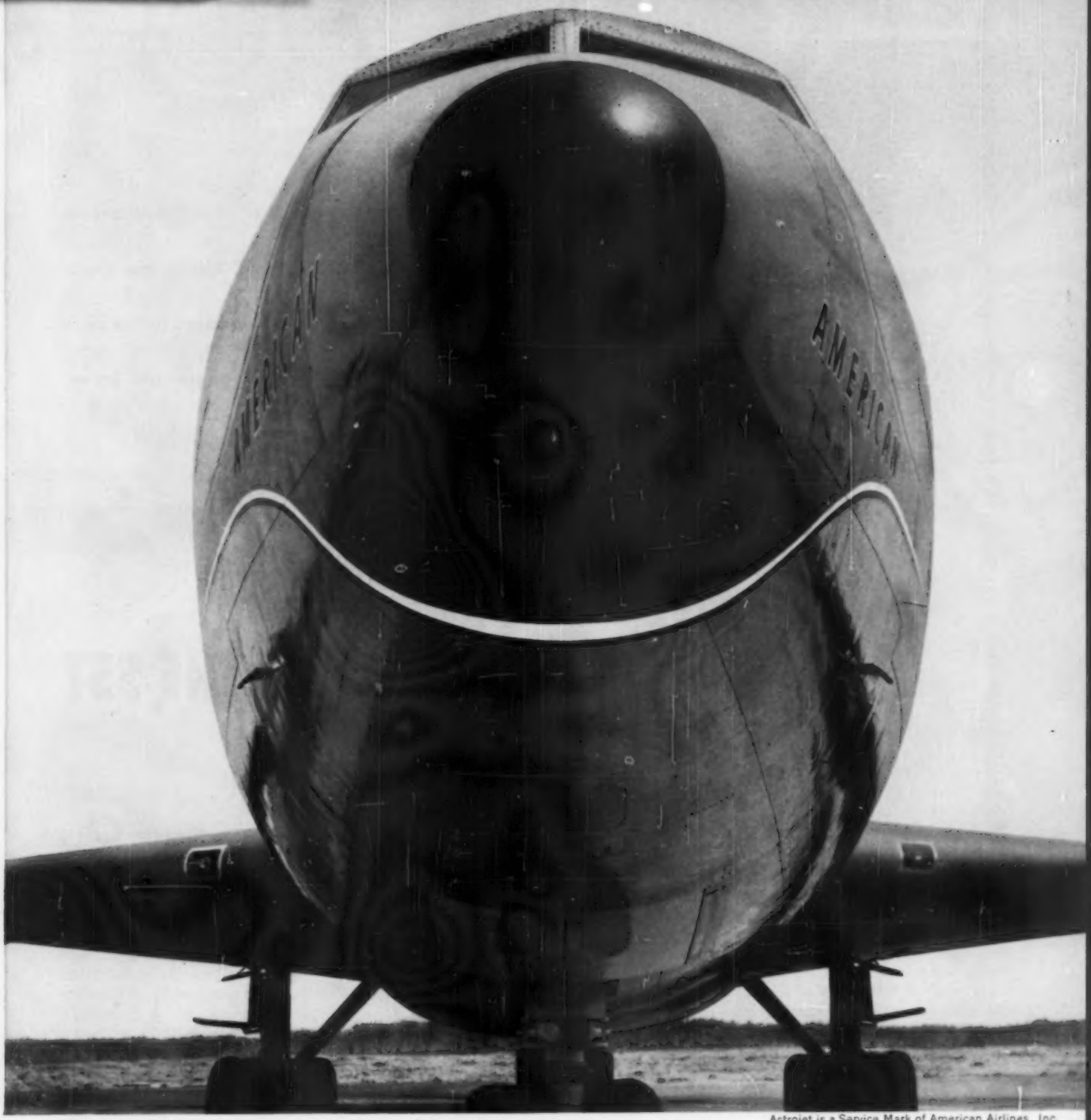
The issue now at hand—men emergent or submergent—has been disputed since time began in a myriad forms of tyranny—despotism, feudalism, socialism, credal intolerance, communism.

But it has never been disputed in proportions which simultaneously and decisively impacted on the whole of civilization, never been disputed when all mankind was vulnerable. Now the proportions are those of Armageddon. People who have no heart for the issue on the theory that the existence of civilization is threatened must consider the alternative—abandonment of the concept of man as an individual—the madness of man in spiritual isolation.

The coming year may well witness a showdown on the basic issue. Presumably there are those who lament that they are involved. Presumably there are those who cry peace at any price. Certainly there are those who would compromise their heritage for a mess of pottage. There always have been such and there always will be.

But not of such has this nation been built and not by such will freedom and faith be vindicated. Let us identify them not by their avowals and semantics but by a roster of those to be pitied as the poor in spirit.

And as for the rest of us—what greater privilege have men ever known than to be present at Armageddon; to be chosen for the great challenge? Must we not to be the envy of all who ever had faith, of all who ever loved freedom? What a day to see! What a time to serve!



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AMERICAN AMERICA'S LEADING AIRLINE

Mach 2 or 3? Aluminum or steel? Tomorrow or the day after tomorrow? These are some of the questions faced by planners in the race to be first in the world's supersonic travel

SST

D-DAY FOR THE SST

By DAVE LEWIS

LAST MAY, a B-58 Hustler streaked faster than sound from New York to Paris. In slightly over three hours, it virtually ushered in the era of supersonic transport, the SST.

Traditionally, when a military plane advances the state of aviation art, its commercial counterpart apears on the scene within a few years. Swept-wing B-52s and B-47s, for example, provided about 10 years and 25,000 hours of flight experience for the first subsonic jet transport, the Boeing 707.

Having reached its peak with the Paris flight, the 1,400-mph Hustler is considered by many as a logical starting point for the SST. Credentials for the Strategic Air Command bomber include several thousand flying hours. True, less than one-tenth of these hours have been at Mach 2 (considered the very slowest speed for an SST), but the Hustler's feat represents the only Mach 2 experience gained to date by a "big" plane.

These facts, plus much verbiage touting the virtues of lunch in London followed by brunch in New York—via SST—are causing the public to concede the United State an unofficial lead in the race to put the first SST in the air.

But indications are the United States lead is slim, if indeed it exists at all, for a number of foreign powers, including Russia, also covet first slice of the SST pie.

The Soviet possibly tipped its hand in July at the Tushino air show. Western observers were impressed with a galaxy of new Red airplanes, including the giant Bounder, a four-engine, delta-wing bomber nearly 200 feet long and obviously supersonic.

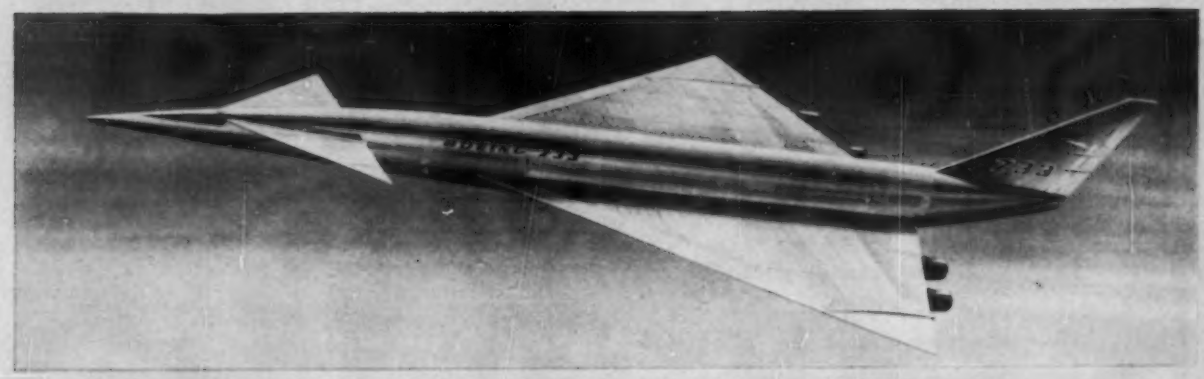
Experts feel that the extra-long Bounder fuselage can be used to accommodate troops or passengers. An obvious stepping stone to an SST!

"There's little doubt that the Soviets would convert the Bounder to a transport if they thought it could be used for propaganda or logistic purposes," a Western observer noted.

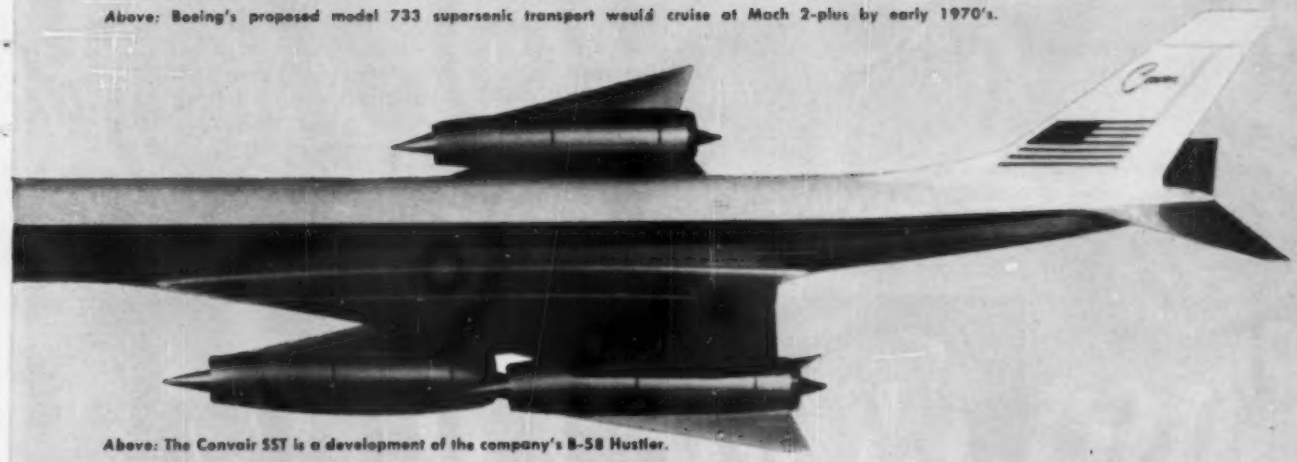
C. R. Smith, president of American Airlines, voiced a sentiment and possible fear held by many U. S. citizens: "One of the worst beatings we'll ever get is if we have to look up to a Soviet SST the way we had to look up to the first Sputnik."

How could the Soviet beat the United States to the punch in the SST sweepstakes? Conceivably, by developing the Bounder, on a crash basis, into a transport of Mach 2 to 2.4 capability, while the United States went for a more sophisticated Mach 3 (2,000 mph) SST.

For this reason, some experts like Sir George Edwards, executive director of British Aircraft Corporation, are admonishing his countrymen to boycott a Mach 3 SST. "Take my advice and don't fall for it," he said. "If the Russians . . . wanted to make an all-out attack on the economy and substance of the airlines and aircraft manufacturing industries of the West, then easily the cheapest way . . . would be (*Continued on page* 60)



Above: Boeing's proposed model 733 supersonic transport would cruise at Mach 2-plus by early 1970's.



Above: The Convair SST is a development of the company's B-58 Hustler.

Above: North American's oft-delayed and slowly developing B-70 Valkyrie, shown in artist's concept, would provide Mach 3 experience by 1975.

Above: Record-breaking Convair B-58, one model for an interim supersonic transport, has already logged nearly 1,000 flight hours above Mach 2.

PART I

General aviation abroad is experiencing a boom, to a large extent because of the efforts of U.S. manufacturers. But high duties, other restrictions delay progress

By MYRON B. GUBITZ

Impact of U.S.

It is entirely because of the availability of American aircraft that this country is turning to business aviation."

"American aircraft have sparked the re-birth of light aviation here."

"We're just sitting on the edge of an enormous potential market for business aircraft here in Europe . . . and American aircraft will capture a large part of that market."

"No one can manufacture light-twins like the U. S. companies . . . good aircraft at good prices."

These statements, made by key figures in European general aviation, reflect the enormous impact that U. S. utility aircraft have had in recent years on the development of private and business flying in Europe.

Unlike the United States, where sales of private and business aircraft reached a record high of more than $200 million (7,588 aircraft) in 1960, general aviation is still in a relatively unsophisticated state in England and on the Continent.

The effects of World War II have only recently fully worn off, psychologically and economically. Now that the various European economies seem to have risen to their feet, the sales of business aircraft have taken a marked upward turn, and every indication is that this trend will continue as European businessmen catch up with their American counterparts in realizing the importance of aircraft as a valuable business tool.

Some extent of this incipient "boom" can be gauged by the following figures:

In 1947, a total of three Beech Bonanzas were sold in Europe. By the end of 1960, there were 138 postwar Beech aircraft registered in France, Germany, Austria, Switzerland, Italy and Belgium.

In 1952, Cessna exports to Europe totalled four; but in 1960, 86 Cessnas were sold in Europe and England, and sales in 1961 amounted to 91 aircraft. Nine new dealers of the Cessna line have been added since last year.

During the fiscal 1959/1960 year, Beech sold a total of 29 aircraft representing retail sales of $2,839,745. During the 12 months of fiscal year 1960/61 dollar volume of retail sales was $5,709,979 for a total of 37 aircraft, with the greatest volume of sales coming from Switzerland and West Germany. Most popular model is the Queen Air, six of which sold during 1959/1960 and 14 during 1960/61. Ten Beech Barons were sold in 1961.

Beech forecasts an increase of 25 to 50 per cent in sales for 1962, provided that present European economic boom continues and the political situation does not deteriorate.

Piper sales during the fiscal 1960/61 year amounted to 193 aircraft for a total manufacturer's price of $1,947,666. Most popular model was the Colt, 95 of which were sold. Thirty Colts went to Sweden, where the Swedish Aero Club has named it the standard airplane for all its clubs. Piper is projecting greatly increased sales over its entire export market.

Aero Commander delivered five aircraft in 1960 and ten by end of September 1961. Presently the company has distributors in Italy, West Germany, England, France and the Scandinavian countries. It expects to double the sales in 1962.

Another U. S. aircraft becoming popular in Europe is the Mooney. European exports reached a total of 19 by November first of this year and are expected to double in 1962.

In 1947-48, seven Bell helicopters were sold in Europe; 1960 deliveries were 47, and the total number of Bell helicopters registered in Europe, both in military and civilian use, was 591. (Nearest competitor: the French Alouette, with 535 machines in Europe, mostly in France itself.)

The slow start of postwar (*Continued on page 72*)

Lifting of import restrictions in England in 1959 spurred big strides in business aviation. Above, Piper Aztec owned by the Pressed Steel Co., Ltd.

Aircraft in Europe

Beech Debonair with Swiss markings silhouetted over the canals of Venice.

Included in air freight parts shipment to Austria is a Cessna wing.

Beech models at Transair, in Colombier near Neuchâtel, Switzerland.

NEW ROLE FOR NOMAD

The T-28, phased out as an Air Force trainer, takes on a new role as both civilian aircraft and desert war fighter-bomber

By RICHARD L. SWEENEY

Right: Mark II version is powered by 1,425-hp Wright engine, has good maneuverability.

Below: Conversions of the North American aircraft are done by the Pacific Airmotive Corp.

For any pilot who flew the classic North American P-51 during or after World War II, handling the controls of the NAA/PAC Nomad will most surely "turn back the clock," as the converted T-28 shows its kinship to the Mustang.

Even loafing along barely above stall speed, Nomad honestly tells the pilot he is in full charge of a definitely going concern.

The Nomad conversion used in FLYING evaluation was N260PA, which carried a black and white paint job responsible for its name, the Blackbird. The airplane was a Mark II version of the Nomad *(see box)*, using a 1,425-hp. Wright engine, with gross weight approximating 7,720 pounds at takeoff from Burbank, Calif. on a hot afternoon.

Conversion of the T-28 to Nomad is being done by Pacific Airmotive Corp. of Burbank, Calif., under license from North American Aviation, Inc. PAC pilot Floyd Matthews was along on evaluation flight.

Walkaround preflight inspection of the Nomad is completely straight-forward, there are no unusual or nonstandard critical items to be watched or hard-to-see checks to be performed.

Cockpit of the Blackbird has an unmistakable military origin. The instruments from the trainer were retained along with most of the usual equipment, but radio gear was changed to suit its civilian role.

Rotation speed for the Nomad in a normal, no-flap takeoff is 95 knots. However, Blackbird was allowed to reach 105 knots for initial liftoff, after which a steep climb angle was assumed and held. Terms like "homesick angel," or "scalded cat" nicely described the Nomad's climbout—using METO (maximum except takeoff) power the aircraft climbed at well over 3,000 fpm. The temperature, about 95 F or better on the runway, made takeoff density altitude approximately 8,000 feet msl.

Nomad trims out well in all configurations and flight regimes. The airplane is more sensitive to roll trim than pitch and yaw, but despite the roll sensitivity, overall trim characteristics are very good, and a "hands off" condition can be attained in climbs, turns, level flight, and descent.

With power set for long endurance, Nomad is comfortable compared to many airplanes of comparable category, with variations in pedal and seat adjustment allowing a change of position as often as desired. Controls are easily reached, even when not looking.

In all normal flight regimes, turns, climbs, descents, slow flight and high performance, the airplane displays an excellent combination of controllability and maneuverability. It is inherently stable, although it has a wide center of gravity range, from fuselage station 95.1 to 100.41.

After initial familiarization with the Nomad, the more unusual flight regimes and conditions, i.e. aerobatics and limit maneuvers, were tried since this type of flying cannot be done with the usual run of airplanes.

The Blackbird does an excellent aileron roll with a minimum of control movement required to keep the airplane in the groove as it goes around.

At normal cruise power setting, torque is not too disturbing in any maneuvers, and if trim compensation is used in stalls, handling characteristics are excellent, although they are very good without trim as well.

In a 90-degree Immelmann, a maneuver which gives an excellent sampling of the airplane's maneuverability the Nomad rolled out of the (*Continued on page* 91)

SHOCK WAVES-INVISIBLE

Can supersonic aircraft and small airplanes safely cross air paths? Read this evaluation that looks to the future

By J. S. BUTZ JR.

LIGHTPLANE HAZARD?

WHAT WOULD HAPPEN if a supersonic aircraft inadvertently flew close to a lightplane and hit it with strong shock waves? Could the shock waves damage or temporarily unbalance the light aircraft? In the years since supersonic flight has become almost a daily occurrence in the United States, these questions undoubtedly have run through the mind of most private pilots at one time or another. It has been only within recent months that some positive answers have been obtained. For the first time, flight tests have been run with the specific purpose of determining shock wave noise and damage which can be produced by the supersonic airplanes now flying. These tests, conducted by the National Aeronautics and Space Administration (NASA) have tended to confirm previous engineering predictions that the lightplane would not be damaged or unbalanced unless the supersonic aircraft passed within a few feet of it.

The future, however, probably will not be so rosy. Other NASA studies predict much heavier supersonic airplanes, now in the planning stage, such as the B-70 Mach 3 bomber and the supersonic transport, will present a much more serious problem than the lightweight supersonic models now in service.

As far as today's situation is concerned, it was predicted several years ago that there would be no damage if a light supersonic airplane passed more than 500 feet away from a lightplane. With this separation distance it was estimated that the lightplane's inner structure and covering material, whether wood, canvas or metal, would not be harmed and its flying qualities not impaired.

Through the 1950's, no flight tests were made to prove or disprove the theoretical estimates. It was possible, however, to obtain some rough verification for the no damage theory simply by observing the considerable amount of supersonic flight testing being conducted by the military and the aircraft manufacturers.

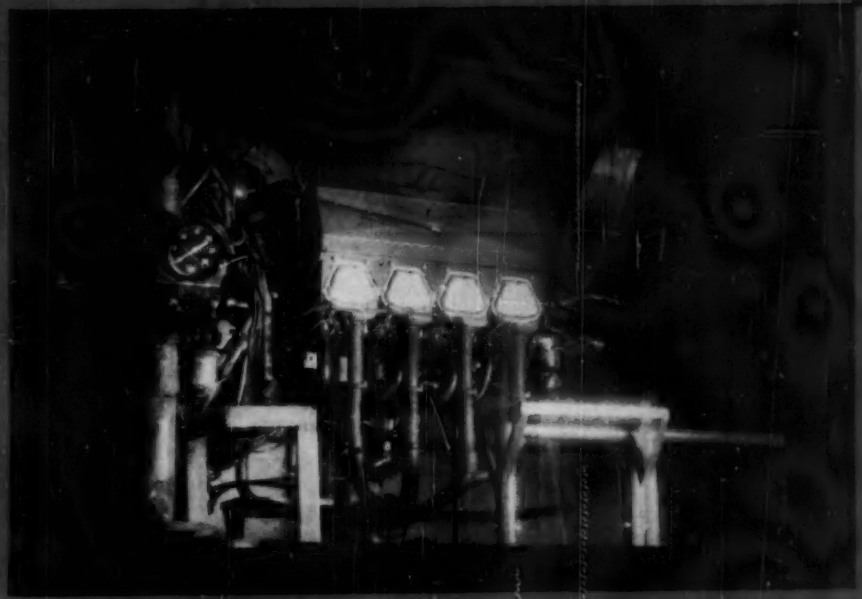
Measurements made during these tests showed, in general, that the shock waves created by an aircraft flying Mach 2 or below were weak and had lost most of their strength at a distance of 1,000 feet from the aircraft. The exact danger from the stronger shock waves in close to the airplane could not be determined from the limited information available.

One thing was positive and certain from these tests. The shock waves were not dangerous at a great distance from the airplane. They were in no way comparable to the strong swirling vortices of air which trail, sometimes 2,000 feet or more, behind the wings of both subsonic and supersonic aircraft and form an invisible hazard for lightplanes. These vortices, which will be discussed in detail later in the article, have the power to dump lightplanes and even light transports of the DC-3 class completely over. If a lightplane flies through the center of a vortex behind a heavy aircraft, it is possible for its wings to receive greater loads than they were designed for, so that a failure would occur. Some people in aviation had been worried that shock waves would present the (*Continued on page* 87)

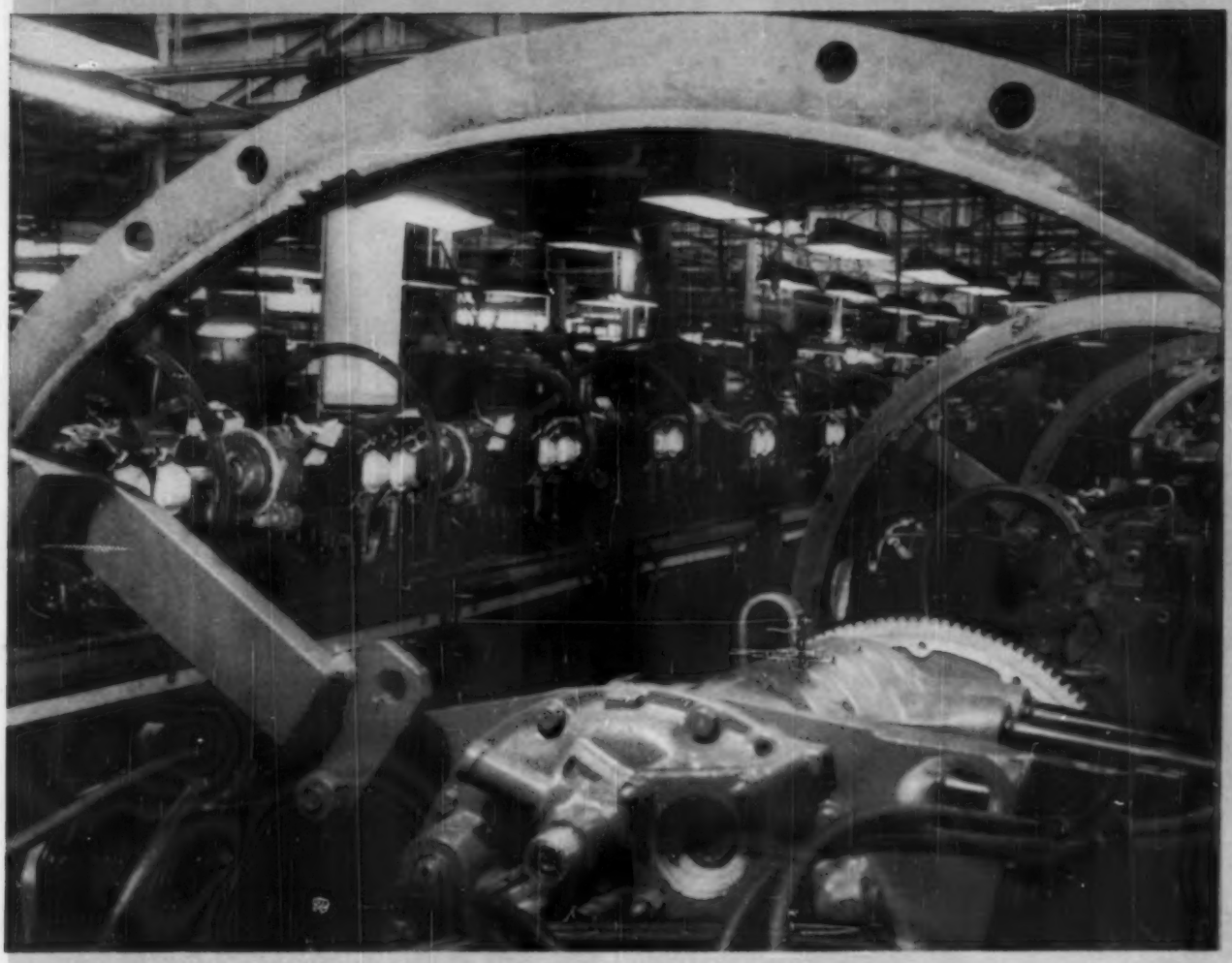
The reciprocating powerplant will be around for a long time. One of the world's foremost builders tells why

By RICHARD BACH

LYCOMING'S PISTON ENGINES



Above: Eight-cylinder IO-720 engine on test stand. This powerplant, rated at 300 hp, is being experimentally flown in a Piper Comanche. Top right: Engines can be rotated for ease of assembly.



LYCOMING ENGINES power fully half of all American lightplanes. The same holds true for three-quarters of this country's light twins and almost every helicopter now flying with a piston engine.

In all, 217 different types of aircraft around the world are powered by Lycoming piston engines built at Williamsport, Pennsylvania.

With confidence born of a background such as this, as well as a record of continuing refinement and improvement of the reciprocating engine, the Lycoming people are looking forward to an equally dynamic and useful future.

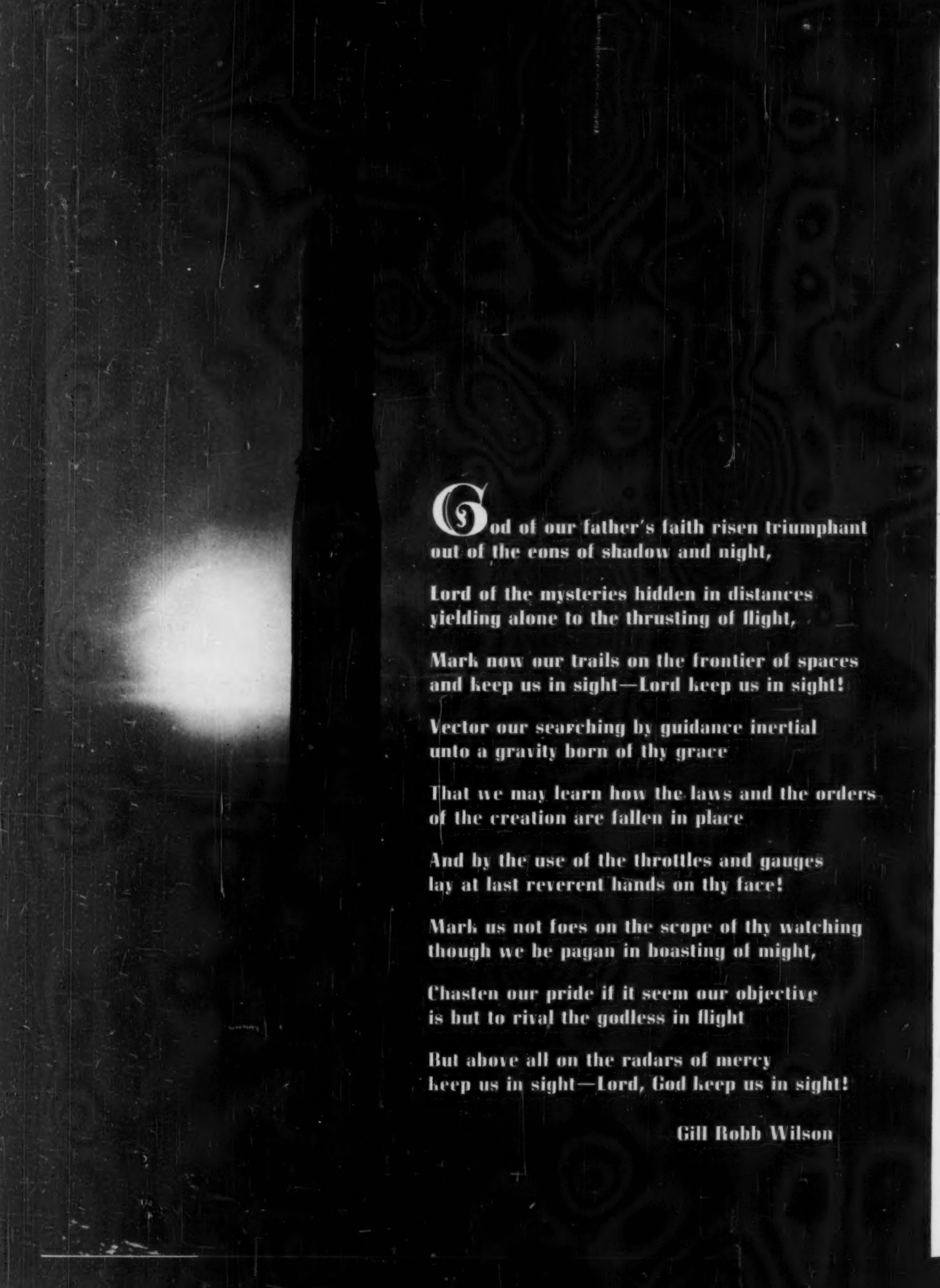
Producing 600 to 700 piston engines every 30 days and set to manufacture its 100,000 this month, the people of Lycoming's Williamsport plant, a division of Avco concerned solely with research and manufacture of light reciprocating engines, are confident the piston engine will be around for a long time to come.

One Lycoming executive, speaking of the new crop of light turbines, said, "They have the romance and we have the performance." At outputs greater than 500 to 600 shaft hp, Lycoming agrees that turbines eventually will replace the piston engine, for here power-to-weight difference is substantial and the turbine's fuel consumption is not so much a problem.

Smaller turbines, the Williamsport spokesman pointed out, are another story. Small turbines require so much more fuel to attain a comparable range with piston engines that their lighter engine is more than offset by the greater weight of fuel that must be carried to feed it. As turbine power comes down near 100 hp, the piston engine is firmly on home ground; its power-to-weight ratio is substantially better, its fuel consumption is much lower, and its cost cannot be matched by the turbine.

But Lycoming Williamsport people do not concern themselves unduly with the thought of turbines, for their job is pistons.

From order to packaged engine (in orders of less than 100) takes about one and a half days at Lycoming. The million square feet of factory responsible for Lycoming piston engines are primarily devoted to machinery that transforms rough forgings of crankshafts, connecting rods, pistons and gears into finished and inspected parts ready for assembly. It is the man behind the lathe and the milling machine that gives Lycoming a reputation for quality and reliability. It is reassuring, as a pilot, to watch a machinist reject a connecting rod and say, ". . . a pilot can't see a little crack, but if this rod broke in the air, he'd (*Continued on page* 80)



God of our father's faith risen triumphant
out of the eons of shadow and night,

Lord of the mysteries hidden in distances
yielding alone to the thrusting of flight,

Mark now our trails on the frontier of spaces
and keep us in sight—Lord keep us in sight!

Vector our searching by guidance inertial
unto a gravity born of thy grace

That we may learn how the laws and the orders
of the creation are fallen in place

And by the use of the throttles and gauges
lay at last reverent hands on thy face!

Mark us not foes on the scope of thy watching
though we be pagan in boasting of might,

Chasten our pride if it seem our objective
is but to rival the godless in flight

But above all on the radars of mercy
keep us in sight—Lord, God keep us in sight!

Gill Robb Wilson

External flap hinges, angular construction mark MH-260. Airplane can carry 23 passengers or 7,500 pounds of cargo over 500 miles, at 244 mph.

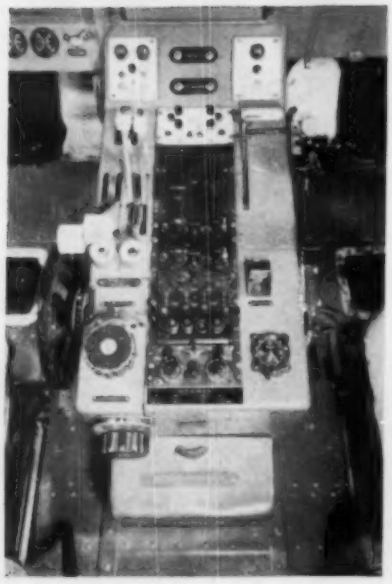
PILOT REPORT

A rugged, rough-field transport, the twin-turboprop Super Broussard carries cargo-passengers, features strong single-engine performance

MH-260 SUPER BROUSSARD

By PETER W. WATKINS

Right: Pitot tube above nacelles senses engine-out pressure drop, feathers propeller.



Right: The MH-260 can be flown by one pilot; throttle and pitch levers, switches are near left seat.

BROUSSARD is the French word for bushranger. Super Broussard is the name given to the MH-260, a rugged twin-turboprop transport designed by the Société des Avions Max Holste for short-hauling passengers and freight under a wide variety of conditions. Powered by two 980 ehp Bastans, the Super Broussard is capable of carrying 23 passengers or 7,595 pounds of cargo over a range of 500 miles at a cruising speed of 244 mph. Very good maneuverability, single-engine performance, and short-field handling were demonstrated by the French-built aircraft during a recent evaluation by FLYING at Melun-Villaroche airfield outside Paris.

The evaluation flight was organized under the auspices of Nord-Aviation, a French government-owned concern which has entered into a joint manufacturing agreement with Max Holste for the MH-260, and in addition has taken over the responsibility for marketing the finished aircraft. Robert Jouannet, the chief flight test pilot for Max Holste who has been loaned to Nord for this project was with FLYING's pilot-editor for the flight.

True to its name, the Super Broussard has been designed to operate as easily from unprepared back-country landing sites as from concrete runways. To accomplish this mission, a particularly resilient tricycle landing gear has been designed and installed. The two main gears are housed in fairings which bulge out from the flanks of the squarish fuselage below the wings. Oleo-pneumatic shock absorbers have been so fitted that ground shocks are triangulated rather than absorbed vertically. An interconnecting torsion bar provides high stability to the system on the ground despite a relatively narrow wheelbase. (*Continued on page* 89)

Pretty Prairie Special III owned and built by Col. M. Unruh of Pretty Prairie, Kan. Menasco engine.

Smith Miniplane. A popular homebuilt made by R. E. Conover of Northridge, California.

EAA FLY-IN

UNDOUBTEDLY the Experimental Aircraft Association's annual Fly-In is rapidly emerging as one of the major aviation events in the United States. Held this year at Rockford, Ill. municipal airport during the first week of August, it attracted more than 120 participant aircraft and hundreds of visiting planes, taxing the Greater Rockford Airport facilities to the extreme. The original purpose of the Fly-In is to convene the EAA members for the annual business meeting, but this has since become of lesser importance as the display and demonstration of various types of aircraft built by the members have become the main attraction. And attract it does, in the neighborhood of 100,000 people attended the Fly-In this year, a figure roughly equal to the entire population of Rockford.

Strev-A²- 1. A parasol built by Carl Strever of Stanwood, Wash., on military duty in Germany.

EAA Biplane. Aircraft was designed by the EAA staff, is available in planform for home building.

Trella T-2. Two-place pusher was originally designed for commercial production.

On display, both static and airborne, were the latest products of American ingenuity and individuality from delta wing to helicopters, racers and gliders. They ranged from spectacularly and expensively reconstructed antiques to plush personal planes.

Prizes were given for such competitive events as short-field takeoff, spot landing, bomb dropping and all-around performance. Trophies were also awarded for workmanship design, distance flown to attend the Fly-In and outstanding services to the organization.

Design and workmanship criteria were of such a high standard that the judges were compelled in many instances to revert to the "dot the I" principal in their selection of winners, wherein a scarred bolt or the wrong bend of a cotterpin would relegate an entry to second place.

Like its eight predecessors, this year's Fly-In closed with a clean record, without a single incident or an accident, which speaks high for the caliber of organization and participation. The Rockford control tower handled over 2,000 aircraft a day during the five-day meet, surpassing the record of Chicago's Midway. END

Tiny Champ. A small airplane built by Wm. Warwick, Torrance, Calif. 65-hp engine.

Mong MS2 Sport built by Roger Rieber of Glasgow AFB, Mont. 65-hp Continental.

Denight Special owned by Wm. Denight of Levittown, Pa. saw action during National Air Races.

Memory Curtiss Jenny. Replica of the World War I trainer restored by 71-year-old A. J. Hartman.

Ingenuity and individuality in aircraft design were the keynotes of this event, which is rapidly growing in stature

By LEO J. KOHN

Pope Thunderbird. An original design by Leon M. Pope of Roseville, Mich. with 100-hp Lycoming.

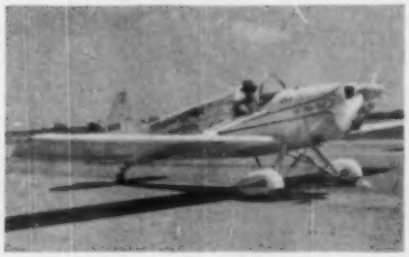
Turner T-40 named Ophelia Bumps, built by Eugene Turner, Fort Worth, Tex. 65-hp Continental.

Schroeder-Meyer Hawk Pshaw in the colors of Army Air Corps P-6E was eye catcher.

Huff Cougar. A fast high-wing by LeRoy Huff, Oklahoma City, Okla. Cruises 150 mph on 130 hp.

Little Love, based on design by Neal Loving. Owner G. Rattray, Beloit, Wis. 100-hp. Continental.

Ferguson 101. A neat design by Cecil Ferguson of Dallas, Tex. 100-hp Continental.



Pober Sport. Built by Norman and Paul Poberzny, EAA officials. Luscombe wings. 85-hp Continental.

Wittman Tailwind. A popular model with homebuilders, built by Wallace Watson, Madison, Wis.

Peterson HCP-1 High Hope. By Harry C. Peterson, Davenport, Ia. 85-hp Continental.

Jodel Club. A popular French lightplane built by Henderson-Brighton, Peterboro, Canada. All wood.

Engle SP-1. A well designed and constructed all metal plane by Engle Flying Service, Bristol, Pa.

Fig. 1. Average number of days with dense fog in the United States. Note the higher number of fog days for coastal and lake areas.

Fig. 2. The percentage of hours in the winter when the ceiling drops below 1,000 feet and the visibility is less than three miles.

Like a thief in the night, fog can sneak up on a pilot and rob him of his prize possession—visibility. Learn to recognize its subtle signs

By JACK LE BARRON

FOG

IF YOU WERE NOT traveling by air a few days before Christmas in 1956, you probably wouldn't remember how the airways were practically deserted over the Midwest and East Coast. The only forms of public transportation moving on any sort of schedule were trains and busses.

No airline strike caused this slump in air travel and there was no lack of willing passengers; this author was just one of many forced to shift from plane to train. The culprit was fog.

A thousand-mile-square mass of fog and rain had dropped a grey mantle over virtually half the nation. At one point dense fog closed every major airport on the East Coast except Atlanta. In Connecticut a four-engine military transport with an overseas destination became lost while attempting to taxi out for takeoff. A truck sent out to find the plane also got lost. Both finally had to be rescued by a man on foot.

Considering our present day sophisticated navigation aids and instrument flying procedures, and how in this example fog rendered them impotent, we can appreciate the feeling of early pilots who attempted to carry mail or passengers in foggy weather without radio or much knowledge of instrument flying. Thirty years of study, for one of the first reports was dated 1929, has lessened but not completely eliminated "The Problems of Fog Flying." Fog, along with thunderstorms and icing, remains one of aviation's "big three" hazards.

Meteorologists define "fog" as a cloud which is touching the earth. A cloud is composed of moisture in the form of tiny water droplets; so we can answer the question, when is it "fog" and when is it "haze"? Haze is created by dust, smoke or causes other than moisture. Fog is distinguished from haze by its essential dampness and grey color while haze produces a uniform bluish or dirty orange or yellow veil over the landscape.

As a general rule haze will never lower the visibility below one mile although apparent distance is less when looking toward the sun: The particles scatter sunlight, but they are too small to reflect it. This may cause a pilot landing or flying toward the sun to doubt a visibility report from the tower or weather broadcast.

One discrepancy in the definition of fog as a "cloud" will become obvious when measuring its degree or thickness. At altitude, visibility in a cloud vanishes down to "zero-zero", but fog has several densities: It is "light" fog (the same as mist) when the prevailing visibility is five-eighths of a mile or more, and will be reported as fog up to a limit of six miles' visibility.

"Moderate" fog is from one-half a mile down to five-sixteenths of a mile. "Thick" or "dense" fog is classed with a visibility of from one-quarter of a mile down to zero. Fog and low stratus are essentially the same, and the technical difference can be so small as to be meaningless to pilots: If the base of the cloud is more than 50 feet off the ground, it is not fog but stratus. The mere change of name is small consolation with field minimums at 200 feet or more.

An old statement attributed to Ben Franklin that "all cats are grey in the dark" could well be applied to fog since, however differently it is caused, it does the same thing—reduces visibilty. However, a pilot cannot afford to let his knowledge stop there. The peculiarities of the several types of fog and why each forms need to be understood in a general way.

Most commonly known type is "ground" fog, or more technically "radiation" fog. The beads of dew which form on a glass of iced tea provide a simple example of how ground fog forms. When room air strikes the cold glass, a thin layer of air (*Continued on page* 74)

Geared to the needs of the private and business pilot, this equipment meets his requirements at a price he can afford

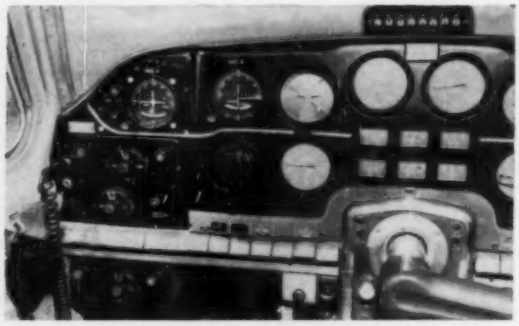
KING RADIO

By A. C. BASS

"TOPEKA APPROACH CONTROL, Cessna 8680 Delta over the Topeka omni inbound to the outer marker . . ." In one position report, a small part of this FLYING evaluation, there lies the basic objective of the King Radio Corporation of Olathe, Kansas. That is to bring the cost of simultaneous communication and navigation equipment within the reach of the operator of light and medium aircraft.

While instrument flights are accomplished many times daily using a single radio for both the communication and navigation function, today's mounting air traffic is creating additional burdens on pilots and controllers alike. It is not unusual for the pilot to make calls on five different frequencies in a ten-minute span. Once airborne, the navigation frequency often must be switched between calls for point-to-point compliance with the clearance.

If one of the larger terminal areas is either the destination or the point of departure, single radio IFR leaves a good deal to be desired.



Beech panel with KX-110, combination navcom, KX-90 comm.

Twin KX-110s mounted on either side of the throttle quadrant.

Sound thinking based on the needs of aviation's private and business pilots created a market for King Radio that has made its two years in this field a $4 million a year enterprise.

Gearing its sales program to a growth pattern for the individual pilot, King has its complete line follow a sequence from basic VFR radio to the most complex IFR, in a price range from $295 to $1,745.

Any pilot should weigh carefully the uses to which he puts his aircraft and have equipment suited to accomplish this mission in line with his own capabilities. Toward that end Edward J. King, president and founder of King Radio, has given the pilot what he calls "building blocks . . . for development of the ultimate

aircraft radio system". The King concept here is to enable a pilot to start with a minimum of equipment representing a relatively small monetary outlay and add units without having to "junk" one piece to get a bigger, more complete one. With King the new piece, or block, is added to the old unit by plugging it in. All King radios from the KY transceiver to the KR nav receivers and the complete KX navcom group are interchangeable mechanically and electrically. In other words the owner of a KY-90 can step up to the 360-channel KY-95 without reshaping his panel opening or rewiring the connections.

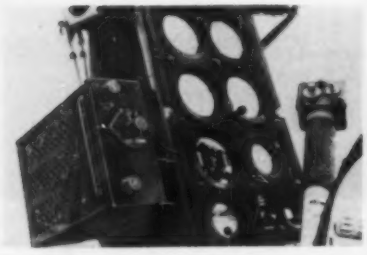
This policy has been carried into each series with the smaller individual units making up the larger navcom packages.

King's own Cessna 310 was flown for the evaluation of its KX-110 communications, VOR, ILS unit with built-in 10-channel glide slope receiver and the KI-210 omni, localizer, glide slope converter indicator.

weight component firmly placed in position, has eliminated the necessity of shockmounting King equipment in any aircraft or helicopter. This simplifies installation, and reduces the panel space required for mounting.

Clearance out of Fairfax Municipal Airport in Kansas City, Kansas to Topeka was routine. With Ed King aboard we commenced a climb out in twin Cessna 8680D to intercept Airway Victor 4 at the Springdale Intersection and continue on V-4 into Topeka for several simulated ILS approaches to test the functions of the installed King units.

Using the KI-210 indicator we tracked accurately to Springdale, then crossed the Topeka omni range. On this clear VFR day we also were able to check ground progress along the flight path with the indicator's omni needle. Land marks en route pointed up the accuracy of the equipment as we repeatedly verified our position. The 210 is geared to an accuracy reading of plus or minus two degrees and placing the aircraft 10 de-

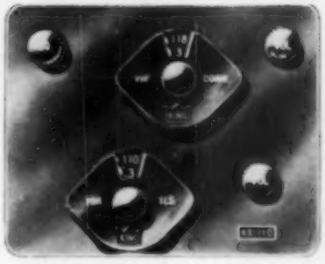


Helicopter mounting of VHF comm.

KR-20 marker beacon.

KY-90 VHF comm.

KN-50 navigation receiver.



KX-110 navcom transceiver.

KI-210 omni, ILS indicator.

The KX-110 includes all the King radio "blocks" to its complete IFR system up to the new 360-channel navcom gear.

The neatness of the cockpit radio installation attests in part to the degree of precision engineering that goes into King equipment. Occupying a small panel area of six and a half by eight and a half inches, eight inches deep and weighing only nine pounds with its separately mounted power supply, the KX-110 houses a 90-channel comm transceiver (KX-110), and the nav receiver with 10-channel glideslope receiver (KN-50).

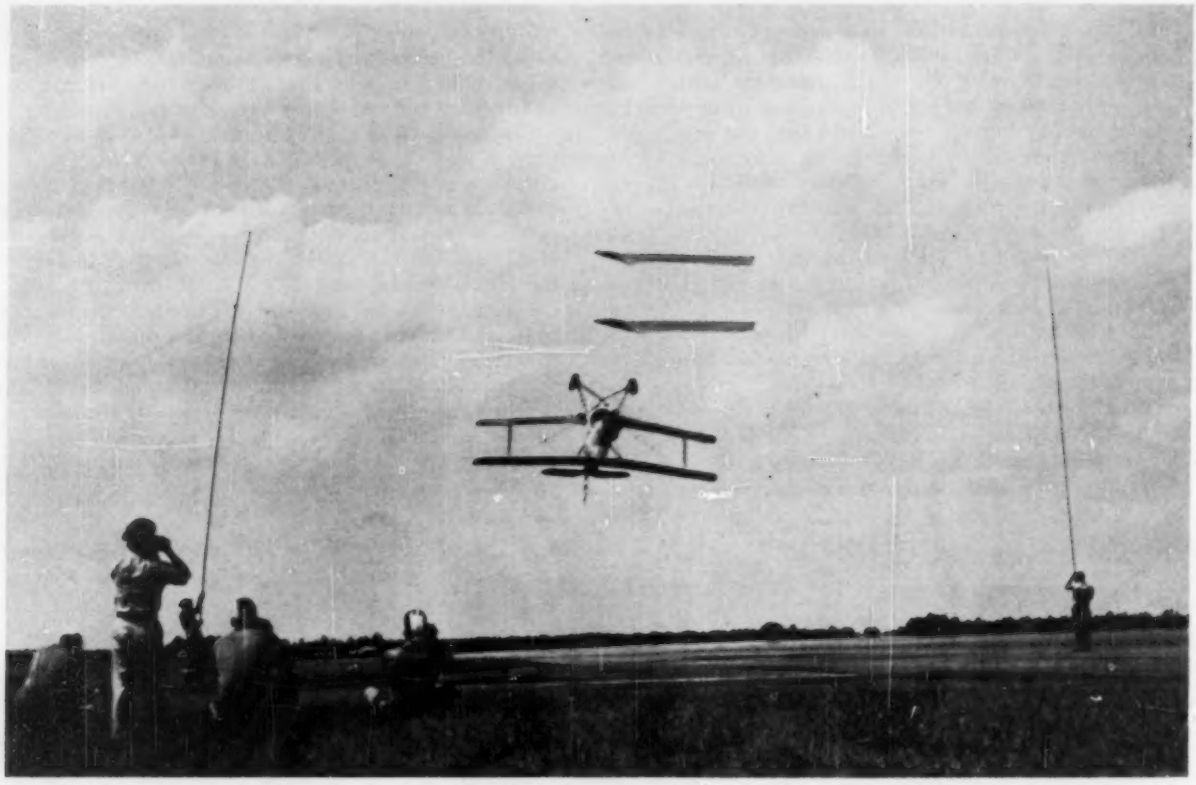
The KI-210 indicator fits the standard three and a quarter inch square instrument opening and weighs two and a half pounds.

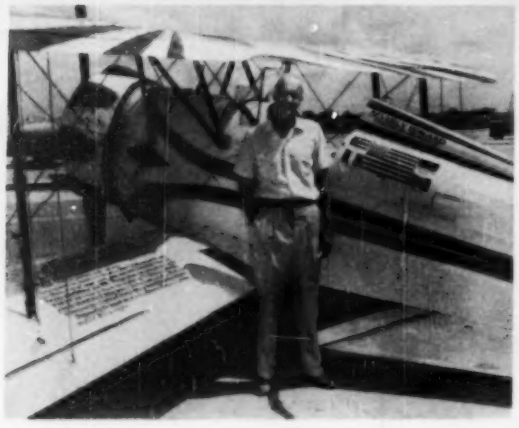
The basic construction of the unit, with each light-

grees off course gave a full scale needle deflection. Station passage indication was clean with full flag deflection into the "from" window as we passed directly over the omni.

After initial contact with Topeka approach control we proceeded to the outer marker for our first approach.

The panel-mounted KR-20 marker beacon was set at *hi* sensitivity on the four-position switch *(off-hi-lo-mute)* to allow a pick-up of only 250 microvolts. This gave outer marker beeper indications while coming out of the procedure turn prior to crossing the outer marker. Time was then available for us to set up the aircraft for the approach before becoming involved with the let-down procedure. In this con- *(Continued on page 70)*





Above: One of the highlights of Bevo Howard's aerobatic show is the inverted ribbon pickup from threads 18 feet above the ground. *Left:* Internationally-known aerobatic pilot stands with his 1936 Buecker Jungmeister, considered the best stunt-flying airplane. *Opposite right:* USAF Thunderbirds in diamond formation.

INTEREST IN the type of aerobatic flying that originated in the early 1900's and was developed to a fine art in the late 20's and early 30's is definitely on the increase. Today there probably are less than 10 top aerobatic pilots in the country. Yet thousands of pilots want to learn about aerobatics and the flying of the older airplanes.

It is unfortunate that there are so few top aerobatic pilots. Let's examine some of the reasons that contribute to the shortage, in hopes that we can help those interested in aerobatic flying decide whether to get into it seriously or to watch someone else do it.

There is no shortcut to becoming a good aerobatic and exhibition pilot. A relatively small percentage of pilots have the desire to do aerobatics. To become a proficient and safe aerobatic pilot requires considerable flying experience in addition to the right temperament and desire. Just as important is the proper equipment. Considering that special equipment is fairly expensive and has a limited use, it's easy to see why the field is quickly narrowed. Fortunately for golf enthusiasts, that game is within easier reach than aerobatic flying is to its devotees.

Who are some of the top aerobatic pilots today? There is Hal Krier of Wichita, Kan., the present national champion, who does beautiful aerobatics in a modified Great Lakes trainer. Rod Jocelyn of Langhorne, Pa., recently has built his own special aerobatic airplane and is one of the finest aerobatic pilots anywhere. Rod is a pilot for Pan American World Airways. I would rate highly Frank Price of Waco, Tex., who recently participated in aerobatic competition in Europe with his modified Great Lakes trainer.

Charlie Hillard is a young pilot who is doing a grand

ART OF AEROBATICS

There is no quick road to becoming a good aerobatic pilot. But here are some guides to follow, by the best-known U.S. stunt pilot

By BEVERLY HOWARD

job in a clipped-wing Piper Cub, the same plane that I flew for years in almost every major air show and with which I won two national titles. Joyce Case does a fine job in a Pitt Special and soon should take Betty Skelton's place as the leading lady aerobatic pilot in the United States. Bill Adams in his Wasp Stearman is doing a first-rate job. Bob McComb and Dave Binns are my favorite comedy flyers. Mike Murphy, who for many years was one of the most accomplished and versatile pilots this country ever has produced, is retired. Woody Edmundson, "Squeak" Burnett, Marion Cole and George Young have retired after making enviable records as aerobatic pilots.

Scarce, aren't they? And the same holds true for the rest of world aviation. Many countries can't boast of a single top aerobatic pilot. In spite of this, there is a lot of interest throughout the world in aerobatic flying.

The question has been asked, "why don't American pilots put as much emphasis on aerobatics as the average European pilot?" General aviation in many foreign countries still falls largely in the categories of sport and private flying. In the United States general aviation is thought of as all aviation outside of scheduled airlines and the military. General aviation in America has become an important part of business and a large percentage of general aviation aircraft are being manufactured as business machines.

The average American manufacturer and user primarliy are interested in speed, comfort, safety and reliability in the aircraft, while European flyers look upon the aircraft more as a sports machine. A limited amount of aerobatics still is considered to be an important part of the training of an American pilot, but the emphasis is put more on using the airplane as a means of transportation rather than developing the fine points and maneuvers of aerobatics. A lot of pilots in this country are afraid to fly on their backs simply because they haven't been trained in aerobatics. In this sense, more aerobatic instruction would help make a better and more confident pilot.

The average pilot can gain many advantages by becoming more familiar with aerobatics. The first and most important one is that it makes him more familiar with his aircraft in all positions. This makes him a safer and more competent pilot. I often wonder whether Bill Odom's accident at Cleveland could have been prevented had he been more familiar with aerobatics. About an hour before his ill-fated flight he said to me, "Bevo, I plan to come down to (*Continued on page* 85)

FARNBOROUGH AIR SHOW

Show window of Great Britain's aircraft industry, the event heralded this year the country's serious endeavor to enter the lucrative field of general aviation

By JOHN FRICKER

AFTER MANY YEARS of neglect in Britain, general aviation is coming back into its own. Much of this revival is due to the impact made on the British scene by American lightplanes (see page 24) since they have been permitted to be imported over the past couple of years. Their success finally stimulated some action in the aircraft industry in Britain, the first fruits of which formed a major part of September's 22nd annual display by the Society of British Aircraft Constructors, at Farnborough's historic site.

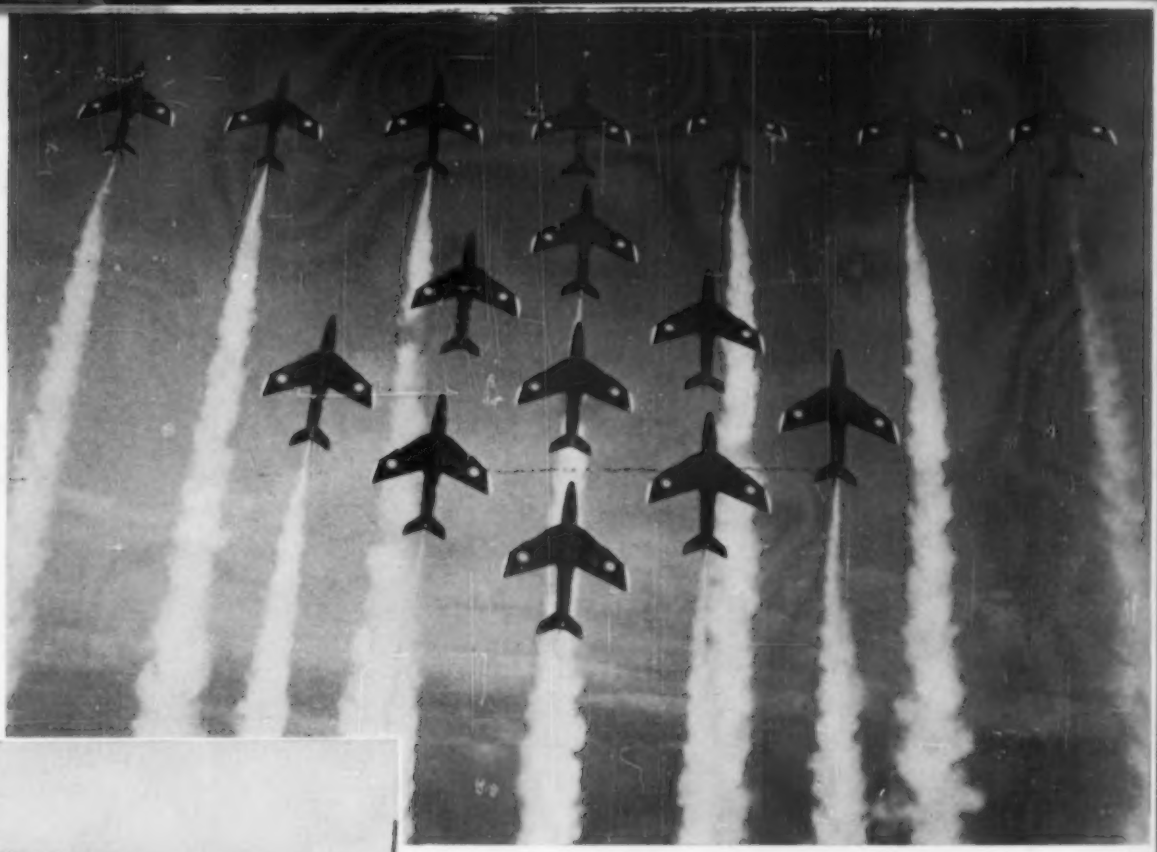
It was left to the first products of the dynamic BEAGLE Group—which did not exist at the time of the previous show in 1960—to steal the technical limelight in the display program. The promising new B.206 executive twin, which first flew only a week or so beforehand on August 15, was one of the two new aircraft on show at Farnborough for the first time, and was strongly supported by several other relatively new runners in the BEAGLE pack. The use of American powerplants is a cornerstone of BEAGLE policy, and as foreign products, a range of Continental engines was allowed to be showed at the all-British S.B.A.C. show both in static display and in the new aircraft by virtue of their licensed construction by Rolls-Royce.

Three Continental powerplants were displayed on the Rolls-Royce stand, including the 100-hp O-200, the 145-hp O-300 and the completely new 310-hp GIO-470. The biggest of the trio was making its first public appearance on either side of the Atlantic, and is to power production examples of the five- to seven-seat B.206. This is currently flying with two U.S.-built Continental IO-470s of 260 hp in protoype form, and is achieving remarkably rapid success in its flight test program. On the day of its first flight, it made four test sorties in all, totalling more than three hours flying, and went on to complete about nine hours in three days.

Since its formation in October last year, BEAGLE has assembled together some of the most brilliant brains in the British aviation field, under the energetic tutelage of Peter Masefield. People like the prolific Miles brothers, F. G. and George, Dick Bird, former

Right: Beagle B.206, prototype of England's latest business aircraft.

Below: The turbine-powered Wessex helicopter towing a 50-ton load.



Above: RAF's Blue Diamonds aerobatic team in a three-formation loop.

Above: Handley Page H.P.115 slim-delta aircraft.

Below: Static display of the Rolls-Royce delta-wing strike fighter.

chief designer of Auster Aircraft, Ron Woodhams and many others. Masefield's main achievement has been to weld together into a formidable team a number of avowed individualists, and to depart from traditional approaches to design and production with a torrent of fresh thinking. Much of this derives from the parent organization of the BEAGLE Group, the soundly-established Pressed Steel Company, which supplies a large part of the British automotive industry with car bodies and associated components.

The executive flying market, at which the B.206 is expressly aimed, is naturally one of its main interests, but the range of new designs displayed at Farnborough, whether in actual hardware, model or mock-up form, showed that Pressed Steel/BEAGLE are setting their sights high. Apart from the B.206, which had to content itself with a simple fly-by, since its privately-demonstrated upward-rolls were not permissible with its current temporary C. of A., BEAGLE items in the flying display included the first Continental-powered Airedale, the re-engined Continental Auster Mark Eleven and the rebuilt ex-military Auster Mk. 6 presented as the Terrier.

Currently built with the Lycoming O-360 of 180 hp, the four-seat Airedale, which exemplifies BEAGLE policy of continuing the high-wing Auster range at least until the new Miles designs are ready, has been fitted in prototype form with the geared Continental GO-300 developing 175 hp for takeoff. There is virtually no difference in performance, but the Continental-Airedale, which corresponds fairly closely to the Cessna 175 except for its considerably (*Continued on page 77*)

San Francisco & Oakland Helicopter

A non-subsidized helicopter airline? Don't be ridiculous. It won't get off the ground!" Such was the thinking of many persons familiar with the hazards and intricacies of airline operations at the announcement last January of the establishment of the San Francisco & Oakland Helicopter Airlines, Inc., as a non-subsidized scheduled carrier.

But there was one item these thinkers did not take into account. The "item" was M. F. (Mike) Bagan, president and spearhead of the operation, which not only did "get off the ground" but is ready to expand service after only three months of booming business.

With the other scheduled helicopter airlines long in operation at Chicago, New York and Los Angeles, Bagan surveyed the San Francisco area for potential helicopter service, scheduled but non-subsidized in contrast to the established lines. Intensive study indicated that the area promised passenger revenue to operate successfully without Federal aid.

There are 88 applications now on file with the Civil Aeronautics Board for certification and subsidy for scheduled helicopter services. During the past 10 years efforts and applications have been made by helicopter operators already in the Bay area. But applications are not being approved, and primarily because of the subsidy requirement.

Having evaluated the possibilities, Mike Bagan, with Irish tenacity and vast experience, began organizing his operation. Bagan's experience includes being trial attorney for the CAB's Bureau of Air Operations from April 1952 to July 1955 when he was named assistant and legal advisor to a CAB member. He left the CAB in September 1958 to join Los Angeles Airways as vice president and assistant to the president. Here, Bagan thought, would be his opportunity to become an active part of the short-haul aviation field, a field he felt had tremendous potential for development.

On Sept. 1, 1960, Bagan decided to strike out on his own and left Los Angeles Airways to devote his time to organizing San Francisco & Oakland Helicopter Airlines, Inc.

Choice of helicopter equipment to be used was made on the basis of terrain and the high-density area where the craft would be operating. The selection of the Sikorsky S-62, a 10-passenger, turbine-powered helicopter, gave SF&O the distinction of being the first helicopter airline in the world to fly an all gas-turbine fleet. Further, it is amphibious, an additional safety

Passengers board a Sikorsky S-62 on the downtown San Francisco Heliport in the heart of the financial district. S-62 holds 10 passengers.

First scheduled helicopter operation launched on a non-subsidized basis is off to a flying start. But an uphill climb is in prospect for the carrier before it changes red ink into black

Airlines

By LINDY BOYES

factor for operation over San Francisco Bay. The airline operates a pair of S-62s.

After more than a year of preparation the airline started service on June 1, 1961 between San Francisco International Airport, the downtown Oakland Heliport, Oakland International Airport and the heliport at San Francisco's Ferry Building. A total of 68 flights are made daily.

Already flights to Berkeley, Palo Alto, San Jose and Sacramento, 90 miles distant, are being planned. Berkeley's heliport was completed in October. At Sacramento the helicopter will have a rooftop landing site upon completion of a building now under construction.

But it wasn't as easy as it sounds to get the program rolling. There were problems in securing a landing site at San Francisco. The waterfront belongs to the State of California. The San Francisco Port Authority operates the waterfront for the State. When Mike Bagan proposed a rooftop landing site in the city's civic center, city fathers trembled. Well then, at the Ferry Building on the waterfront? Bagan countered. That's not our property, stalled the city.

While Bagan was trying desperately to offer the community a public service, he was being given the runaround in San Francisco.

Across the bay, however, the Port of Oakland, behind schedule in expansion of its new international airport master plan, greeted the idea openly. The service certainly would help the airline passengers who are forced to go to San Francisco to get their flights. At the proposed fares—competitive with taxicab rates—the helicopter airline was bound to attract other customers and generally be a valuable addition to the present and future airline services offered at the Oakland Airport.

Peter Tripp, president of the Oakland Port Commission, said, "The Board of Port Commissioners has recognized the need for helicopter service and its tremendous potential in the area." A downtown heliport with attractive small building for passengers and ticket agent was established on a temporary site adjacent to the Oakland Exposition Building. The Port has agreed to spend up to $50,000 on a permanent heliport atop a multi-storied county-owned downtown automobile parking facility to be completed in August 1962.

"This," says Don W. Martin, Oakland Airport manager, "could be the finest heliport of any city in the nation."

Back in San Francisco the heliport ball was still being kicked around when an editorial cartoon appeared in a local newspaper. It shows a helicopter attempting to land on San Francisco's City Hall, but a group of men are swinging at (*Continued on page* 66)

Above: Site of the downtown Oakland heliport close by Lake Merritt. *Below:* San Francisco International Airport and turbine-powered S-62.

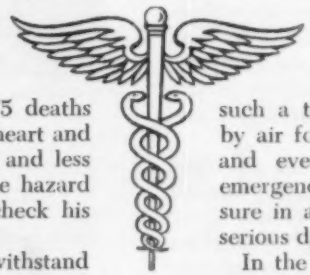
Certain disabilities require special consideration when air travel is planned

THE ILL PASSENGER

By JOHN T. FLYNN, M.D.

DURING A THOROUGH preflight, the pilot should give a few moments' consideration to the live portion of his aircraft's payload. While an inexperienced or frightened passenger might cause difficulty only by failing in an emergency situation, the passenger who is liable to become ill during flight can create his own emergency. The pilot can avoid a serious situation by a quick appraisal of his passenger(s) and the possible problem involved.

Air travel in general is remarkably safe even for seriously ill persons. In World War II, over a million and a quarter ill and injured servicemen were transported by the USAAF, with only 40 deaths during flight; however, most of these had been certified for air travel by medical examination prior to departure. In 20 years of airline operations, only 75 deaths were recorded during flight, mostly from heart and lung conditions. Admittedly, the smaller and less well equipped the aircraft, the greater the hazard and the more carefully the pilot must check his passengers.



Individuals with major illnesses can withstand air travel well under proper circumstances, and in fact such travel is preferable in many cases because of its speed and convenience. Much depends, however, on the speed and duration of the flight, the cabin altitude, the availability of oxygen, and the character of the illness. In general, if the passenger looks, feels, and talks normally, and can climb a flight of stairs without difficulty, he should not cause difficulty during flight, provided the following situations are kept in mind.

The major source of danger to a potentially ill passenger is the change of barometric pressure as an aircraft climbs to, or descends from, altitude. This change during climb will expand any collection of air within the body cavities by 20 per cent at 5,000 feet, 50 per cent at 10,000 feet, and 100 per cent at 18,000 feet. This expansion of enclosed air causes no difficulty in the healthy person, since the aircraft usually climbs and descends slowly enough so that the air can enter and leave the body cavities easily or can be absorbed into the blood stream. The pressure within and outside the body thus can equalize slowly and no symptoms occur.

The body cavities most commonly affected are the abdomen, the chest (pleural) cavities, the ears and sinuses, and much less commonly the spaces around the brain. If air cannot escape or enter these areas with ease, trouble can occur. A passenger who has had a history of obstruction of the stomach or intestine should be careful to avoid the eating of gassy foods and liquids before travel by air; the abrupt expansion of the trapped air within the abdomen may cause kinking of the intestine in the vicinity of old adhesions, with resulting painful swelling and obstruction. For the same reason, any person who has had surgery on the stomach or intestinal tract within the preceding two weeks should not travel by air; expansion of gas in this instance might pull suture lines apart and lead to very serious difficulty.

Certain conditions of the lungs and pleural cavities should be understood by the pilot. Any passenger who has had one or more episodes of spontaneous lung collapse (pneumothorax) is not a good risk for air travel. In such cases the collapse is caused by a break in the surface of the lung at a weak spot, with escape of air into the pleural cavity between the lung and the chest wall. A small bubble of lung tissue on the surface of the lung may expand as the aircraft climbs, and eventually burst, allowing the escape of air into the pleural cavity, where it will further expand as the aircraft continues to climb, with resulting progressive compression of the lung and steady worsening of the patient's breathing difficulty. Descent from altitude and landing may become urgent, though this measure alone cannot correct the difficulty entirely.

Certain lung diseases are treated by the deliberate introduction of air into the chest (pleural) cavity by a needle through the chest wall. A patient with such a treatment-pneumothorax should not travel by air for a period of 10 days after the last refill, and even then should travel by air only for emergency reasons, since sudden loss of cabin pressure in an aircraft at high altitude could result in serious disaster to him.

In the event of trouble with the above abdominal and lung conditions, descent from altitude will help to ease the condition; but the reverse is usually true with air in the ear and sinus cavities. During climb, the expanding air can usually escape from the middle ear and sinuses, even when their openings are inflammed and swollen. During descent from altitude, however, almost always air has great difficulty in reentering infected or inflammed middle-ears and sinuses because of the blocked openings. The resulting partial vacuum created can be extremely painful, and can not only aggravate the swelling but (*Continued on page* 68)

Convention aircraft lining the ramp at Tulsa's municipal airport range from single to multiengine types, including both turboprops and turbojets.

Turbines set for executive fleets

Future trends outlined at the National Business Aircraft Assn. meeting

By LOU DAVIS

DESIGN, specification and performance previews of upcoming turbine-powered executive aircraft—ranging in price from $250,000 to $500,000—drew priority interest at the recent National Business Aircraft Assn. meet at Tulsa, Okla.

Included were Beech Aircraft Corp.'s plans for its first six-eight place twin-turboprop, for which deliveries are expected in 1964 at a basic price of less than $400,000.

The new Beech airplane, stated Leddy Greever, vice-president of domestic sales, will cruise at 300-mph plus over ranges exceeding 1,500 miles. The all-metal, low-wing tricycle-geared turboprop will be fully pressurized. Powerplants were not noted, though indications are that more than one model will be available —these to be driven by Turbomeca Bastan 4 (900 shp category) or the Canadian Pratt & Whitney PT-6 (500 shp).

On the turbojet side, Aero Commander's new Model 1121 Jet Commander is now taking shape in prototype jigs and is scheduled to fly next April. The Mach .8 airplane, fitted with two General Electric CJ-610 turbines of 2,850 pounds thrust each, is a light 14,000-pound VIP carrier with cruise altitude up to 35,000 feet. Certification is expected early in 1963. Basic cost, with no escalation, is $475,000.

In his address, Thomas J. Harris, Aero Commander vice president and general manager, emphasized the need for executive speed in the 500-mph category, which he feels requires business utilization of the pure jet as against competing turboprops.

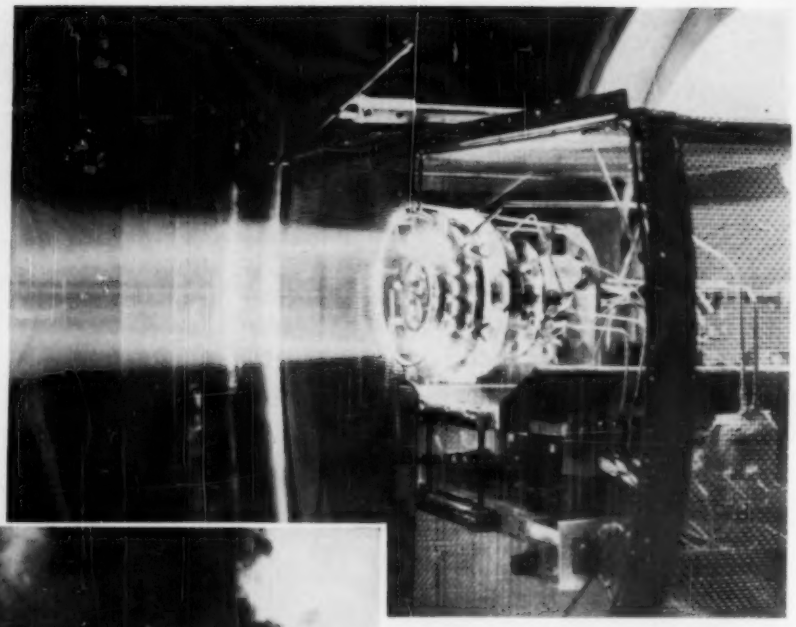
Marketing plans for the new French turboprop, the four-engine Potez 840 (see FLYING for August and November), were outlined by Don Payton, president, Turbo Flight, Inc. (Chicago), North American sales agent of the 16-24 passenger executive transport. The 18,000-pound turboprop will be demonstrated here in 1962, when 24 aircraft are expected to be produced.

The Potez 840 will sell for $460,000, price including cabin interior, navcom equipment (excluding autopilot), and 12.5 per cent U. S. duty tax. Powerplants are four Turbomeca Astazous of 530 shp each.

Swiss American Aviation Corp. of Zurich, Switzerland, will make available its twin-turbojet in the first half of 1963; certification is expected in September, 1962. Designed for CAR Part 3 and Part 4b requirements, the prototype is expected to fly next April. Military potential also was (*Continued on page* 84)

NEWSREEL

ION ENGINE *(Right)*. Electrical powerplant for space flight developed by Hughes Aircraft Co. Thrust is generated by a high-speed stream of ions having a velocity of around 100,000 mph. An element called cesium is used as propellant as its atoms are easily converted into ions. Though thrust of such an engine is very small, considerably less than one pound, in space, where drag does not exist, a cluster of these engines can drive a vehicle at high speed to its destination once its orbit is established. Another advantage of the powerplant is its endurance, which will permit space flights of one year's duration. Republic Aviation has also developed a similar powerplant using nitrogen as fuel.



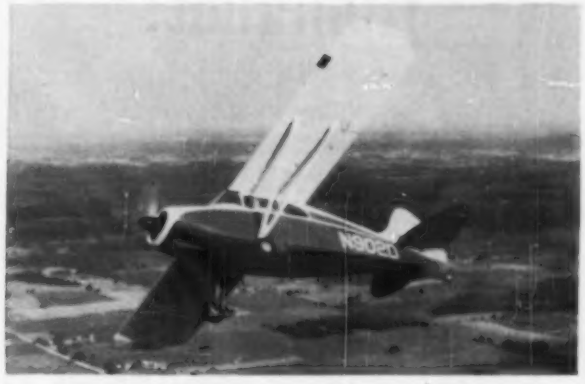
SPANISH BUSINESS JET *(Left)*. Mock-up of a projected six-place jet executive aircraft now under construction at Hispano Aviacion. Many of the components will be that of the Saeta AH-200 military trainer. Aircraft will have a single spar wing with integral fuel tanks formed by the leading edge box. Tip tanks are optional. Powerplants will be two Turbomeca jets of 1,540 pounds thrust each.

BEAGLE AUSTER MARK 11 *(Above)*. British Army liaison and ground cooperation aircraft during demonstration at Farnborough (see page 42). Powered by a 260-hp Rolls-Royce Continental IO-470-D engine, the Mark 11 has STOL capabilities. Span 36 feet 4 inches, length 23 feet 8 inches. Top speed 152 mph.

WALLIS WA 116 *(Left)*. Gyrocopter based on Bensen design developed in England by Wing Commander K. H. Wallis of the RAF. The aircraft will be built by the BEAGLE group for military and industrial uses. Rotor diameter is 20 feet 2 inches. The craft is powered by a 72-hp McCulloch 4318E engine.

NEWSREEL

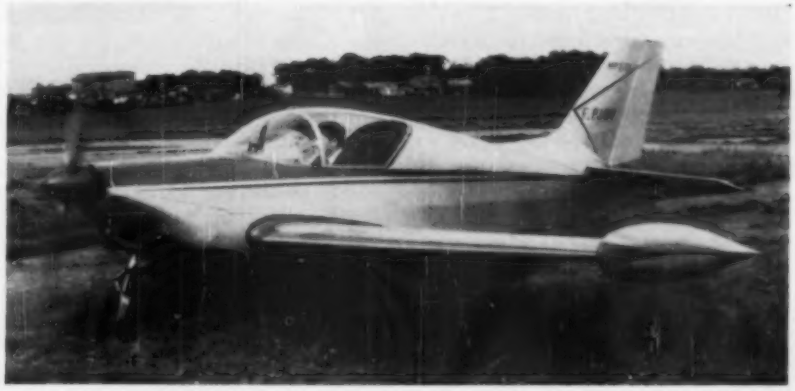
PIPER APACHE H *(Right)*. Latest model of the popular twin-engine executive transport is powered by two 160-hp "ruggedized" Lycoming engines giving the aircraft a cruising speed of 171 mph. Standard Apache fuel capacity of 72 gallons is increased to 108 in the Super Custom and Auto Flite models. Provision for factory installation of more comprehensive nav/com equipment including DME, has also been made. Interior *(below)* of the 1962 Apache features all-leather chairs and three-position reclining backs.



BEE DEE M-4 *(Above)*. Four-place light aircraft by B. D. Maule Co. of Jackson, Mich. All-metal structure is covered by a new life-time fabric impregnated with butyrate fire resistant dope. Rudder and ailerons are interconnected through rudder tab. Powered by a 140-hp Continental.

MP-2 BALADIN *(Below)*. A two-place French lightplane designed and built by Maurice Paumier, chief pilot of the Aero Club de Courbevoie. Tricycle landing gear is manually retracted. Aircraft has all-moving horizontal tail with servo-tab, is powered by a 90-hp Continental. Span is 24 feet 11 inches, fuel capacity 22 gallons. Top speed is 155 mph.

HC-1B CHINOOK *(Above)*. Grossing at 12½ tons during hovering tests, shown here, the Boeing-Vertol Chinook Army helicopter is said to be the most powerful rotorcraft presently in production. Power is supplied by two Lycoming T55-L5 turbines rated at over 2,000 shp each. The U.S. Army has ordered 28 Chinooks.



NO 259

I learned about flying from that!

The engine ran like a clock on the ground, but strange things began to happen in the air during takeoffs

By DONALD E. RONDA

THE SUN WAS SHINING for the first time in about a month. In the distance the volcanoes of Katmai National Monument puffed away serenely, each peak etched sharply against the sky. Their smoke plumes were the only clouds to be seen. "A day in a million!" thought I as I wheeled my Tri-Pacer One-Six-Bravo into the downwind leg of the landing pattern for Naknek village airstrip.

I was returning home from Dillingham, Alaska where my wife had just presented me with our first child.

At the time I was a rather new private pilot with a grand total of perhaps 100 hours recorded in my logbook. I had received my ticket two months previously and was doing my best to be a model pilot.

In a few moments I was flaring out over the end of the runway and braking to a halt at the end of the rollout. As I came to a stop, a bright yellow pickup truck detached itself from the roadway at the side of the field and came over to the plane. Its driver, a fellow pilot by the name of Rasmus Casperson, asked if I might hop him over to Graveyard Cannery to pick up his plane.

I had never landed there before, and in this country, where the strips are about as minimum as they come, the wise pilot goes in the first time with an experienced pilot who can give pointers on the idiosyncracies of that particular field. Rasmus assured me that he was qualified on that score, having lived there for several years; so I decided to take advantage of the opportunity to add a new strip to my collection.

Within five minutes we were circling the Graveyard landing strip. From the air it looked extremely narrow and short. It was located on a peninsula on the only so-called "high and dry" ground for miles around. On the left as we approached were the choppy waters of Bristol Bay and the small graveyard from which the point gets its name. On the right were the corrugated iron buildings of the cannery and the muddy banks of Graveyard Creek. The field was about 1,000 feet long and pitched downhill for the approach we would be making, the lower end terminating at the creek bank. The inland or high end was located on top of a small mound, and here the wind had hollowed out a sand "blowout" as a trap for the unwary. As we circled, Rasmus pointed these out and cautioned me on the necessity of touching down immediately beyond the blowout. As we entered our crosswind leg, we also noted some blowing sand which indicated a probable downdraft or wind eddy just off the end of the runway.

We came dragging in with full flaps, bounced through the wind eddy, skimmed the blowout and touched down right on the button. I pumped the brakes hard and we came to a halt with plenty of room to spare. I turned back toward Rasmus's T-hangar while feeling a certain degree of pride in having made such a good landing on the first try.

After helping Rasmus wheel his plane out, I climbed back in and prepared to return to Naknek. The wind was moderate at about 10 to 15 knots and right down the runway, but it was also picking up a good deal of sand and dust, which wasn't going to do my engine any good. To cut down on unnecessary wear I hurried my ground check of carburetor heat and magneto drop and quickly taxied out the short distance to the end of the runway with carburetor heat off.

Pointing downhill at the pounding waves of the Bay, the runway looked even shorter than it had during the previous landing. Ground check completed, I gave her the gun and One-Six-Bravo hurtled down the runway. With one notch of flaps I broke ground quickly and was on my way . . . or so I thought.

Just as I attained about 20 feet of altitude, the engine began barking and missing badly, threatening to quit cold at any moment. I was just reaching to reduce takeoff power and the unexpected racket up front shook me up a bit. The end of the strip flashed by beneath me and I now faced only the waves of Bristol Bay. Slightly to my left was the marshy tundra of the flats, a poor landing prospect but definitely preferred to the cold and treacherous currents of the Bay.

During the next few seconds I was pretty busy. Almost automatically I went through the emergency routine I had so often practiced as a student.

"Nose down! Carburetor heat! Easy now, don't want it to quit! Hold her flat and level!" The engine seemed to be missing badly but still was operating. "Switch tanks! Fuel gauges both (*Continued on page* 93)

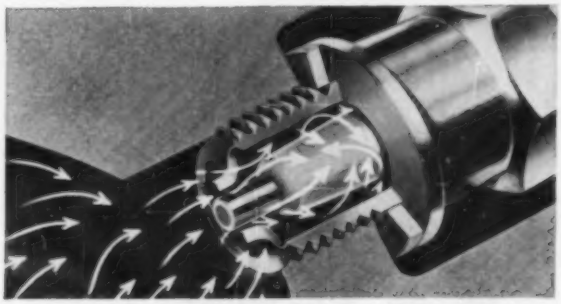
If you spot <u>your</u> Beechcraft, Cessna or Piper listed below . . :

Here's what Champion's new foul-resistant spark plugs can do for you... on the ground and in the air!

On the ground . . . during long, frequent periods of engine idle, these new Champions prevent accumulation of fouling deposits that would form on ordinary plugs! Champion's redesigned firing end makes the difference. Incorporating a new *two-prong* electrode, larger bore and longer core nose, this "opened up" design permits greater entry and circulation of combustion gases—which blast away any fouling matter.

And this effective self-cleaning action promotes other important advantages: far less RPM drop during magneto check, virtual elimination of burn-out, and fewer spark plug replacements! One half fewer, even one third fewer—that's what operators across the country are reporting!

And in the air, too . . . the foul-resistant design of these new Champions continues to assure *smooth* engine performance—even over long-distance flights where deposits could build up on other spark plugs.



Cutaway shows how blast of combustion gases is used more effectively for self-cleaning action.

So equip *your* aircraft with new foul-resistant Champions today! Start enjoying the extra performance-advantages and extra hours of full-firing service these new spark plugs deliver. Approved for all popular aircraft, they are available in EM42E, REM40E and REM38E for short reach 5/8-24 applications; and ALL-WEATHER RHM40E and RHM38E. Available for long reach 3/4-20 installations are RHB37E, RHB32E and RHB29E.

Here are the Beechcraft, Cessna and Piper models for which new foul-resistant Champion types are available . . .

BEECHCRAFT

Model 18S	Twin Bonanza,	Debonair
Bonanza,	all models	33,A33
all models	Travel Air 95	Queen Air 65
		Baron 55

CESSNA

170-A, B,	175-A	195
Skyhawk	180 C&D	210
172-A, Skylark	185, Skywagon	310, C, F
	182, Skylane	

PIPER

Cub	Tri-Pacer	Aztec "250"
Super Cub	"135," "150,"	Comanche
"105," "125,"	"160"	"180," "250"
"135," "150"	Apache	Cherokee
Pacer "115,"	"150," "160"	Pawnee "150"
"125," "135"		Colt "108"

Note: *If your aircraft is not listed above—check with your dealer to see if yours is one of the many other models of aircraft that can be equipped with Champion's new foul-resistant spark plugs.*

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For other courses, see pages 4, 84 & 86

THE THRUST LEVER

BY CAPTAIN DAVE KUHN

That Slick Runway

I SUPPOSE that ever since man has been taking to the air in flying machines there have been occasions when some difficulty is experienced in getting back down in the confines of the prescribed area. True, all that goes up is bound to come down, but the approved method is to be in one unwarped piece.

As airplanes became heavier and faster, they required more runway length.

There have been quite a number of schemes to aid the pilot with his short runway problem. Reversible props were a big help. Concrete (with rough finish) replaced asphalt on newly constructed airports. Anti-skid brakes are some help. On a slick runway they never lock on you; neither do they stop you.

The Navy long has used a system where a hook latches onto a cable for a quick abrupt halt. The Air Force has used a drag parachute on some of its heavy ships. The barrier idea has also long been on military fields. These methods would be rather severe for commercial use since old folks and babies are not physically equipped to stand the stress of these sudden stops. Commercial planes are not as sturdy as fighter ships, either.

While the prop jobs still have some trouble on slick runways, the jets have twice as much. Even on airports with long runways, such as San Francisco, Idlewild, Miami and Denver, wet or iced runways have caused jets to slide off the perscribed area. Reverse thrust most certainly is helpful, but not as effective as reversible props. The lateral control (due to narrow gear) on jets is more critical. They can slide sideways with ease on ice. Scraping and sanding a runway takes about four hours even with a hot-shot ground crew.

If the snow or freezing rain is falling faster than it can be cleared away, the jet service to that field is closed. This is not good reliable service. Professional and business people demand better operation. They do not gear their schedule to the whimsy of nature.

It can be a frighting, helpless experience to slide off a slick runway, I am told. Winter months are more critical. Low ceilings coupled with ice and snow will continue to invite over-runs. It is hard on airplanes and pilots as well. The pilot has to rely on advice from the ground as to braking action. It comes in four categories: good, fair, poor and nil. With freezing rain it can change from good to nil in a matter of a few minutes.

The FAA and the Carriers are desperately attempting to prevent these over-runs. The most commonly used and least effective cure is to fine the pilot, ground him a spell and have him go through a rigorous proficiency check program. To my knowledge, this does not lengthen the runway; nor does it make the braking action any better. It does furnish an outlet for the authorities and has side effects of more cancellations. It is a sure bet that pilots on the receiving end would welcome a demonstration of proper technique (under like conditions) from the boys that found them "negligent." But that is too much to hope for. . . .

Is there any ray of hope for a device to prevent over-runs? You bet, and a strong one. As long as a realization for the need is present (and it is) the best brains of aviation will keep seeking the answer. The most promising idea to date is a contraption named DE CEL.

Dr. William F. Ballhaus, Northrop Corporation Executive Vice President, has spearheaded the Nortronics Division efforts on the DE CEL concept. It is simple, economical and feasible.

At each end of the runway dig a basin a foot or foot and a half deep for a distance of four to six hundred feet in the over-run area. Fill it with water plus some anti-freeze solution, cover it with a flexible plastic sheet, fastened at both ends and you have it. Simple? Yes! Yet it is foolproof and effective.

With the DE CEL concept, a water wave (for boat lovers—bow wave) forms in front of the wheels as the plane's weight is transmitted to the plastic cover. It has the same effect as rolling up-hill at a steep angle. Since most over-runs happen at about 40 or 50 knots, only a few hundred feet of basin would be used.

Tests, using a scale model Boeing 707 on a scale runway and basin, have been most encouraging. Photos of the operation indicate deceleration forces of only about half a G, which babies and old folks would hardly notice. The best thing about the test is that the airplane model stops. The air-safety minded Dr. Ballhaus feels that the "covered landing basin" merits further FAA study and evaluation. The pilots do also.

one...

two...

three...

GO!

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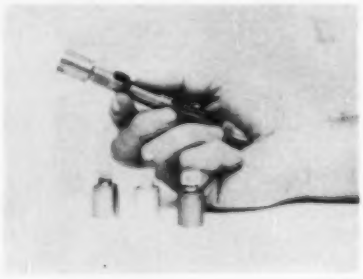
FLYING FINDS

BY NOVETAH DAVENPORT

FOR THE BOOKSHELF you can't miss with a copy of "Modern Airmanship", a basic airman's textbook written for the civilian as well as military pilot. Edited and compiled by Brig. Gen. Neil D. Van Sickle (USAF), and now in revised edition, this book is the work of many experts in the field; incorporates all major aviation changes since 1955; encompasses all basic aspects of aviation and flying. Van Nostrand, Princeton, N.J. $9.95.

FLIGHT LUGGAGE from Spain, this handsome travel companion is of genuine goatskin. Designed for ultimate capacity with two outside utility pockets, the bag has full length zipper, which opens way down for ease in packing and unpacking. In natural tan it is fully lined with silk-like plastic. Sturdy wrap-around strap gives additional security. Postage and tax included at $45. Charmant Imports, Box 215, Garden City 14, N.Y.



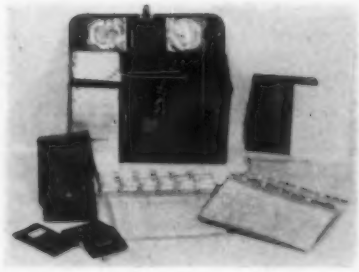
MINIATURE SIGNAL FLARE is ideal for an emergency kit. Five inches long, one-half inch in diameter, this imported flare gun affords 1.3 miles day visibility, 13 miles night visibility and its spring-loaded striker shoots flares to 300 feet altitude. Cartridges can stand between 165 and minus 40 F temperature range. Cost, including nine cartridges—three each, white, red, green—$5.00 pp. Karl Nassauer 81-03 165th St., Jamaica 32, N.Y. Extra cartridges $2 for nine.

FLYING VFR OR IFR the new Omniboard is a real cockpit pal that organizes every item the pilot needs for precision navigation. More than a knee desk, it is designed to place at the pilot's fingertips every aid as the operation calls for—computer, approach plates, charts, check lists, en route flight log, in-flight information, plus many working utensils. By Aero Products, 339 N. Canon Dr., Beverly Hills, Calif., $11.95 to $22.95, at aviation supply outlets.

FOR CHRISTMAS

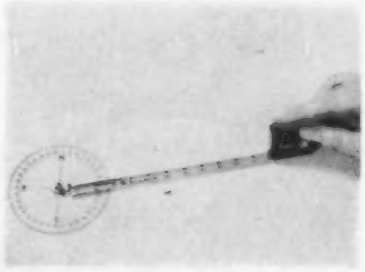
This department is not composed of paid advertising. Items shown are believed to be good values. Companies listed guarantee immediate refund if you are not satisfied.

SCOOTER BUILT FOR TWO—and it's portable. The Centaur has a 44-inch wheel base yet folds to 32-inch size suitable for stowing in a plane's baggage space. Powered by a 4.5-hp engine, the 95-pound, 40-mph vehicle travels 100 miles on a gallon of gas; has automatic transmission. The frame is of welded steel tubing. Of moulded plastic, the main body serves as housing when unit is folded. American Motor Scooter Corp., 7 Park Ave., New York 16. $395.

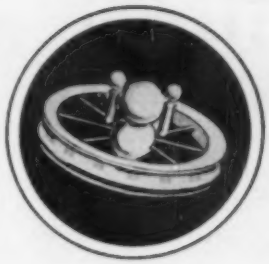


VERSATILITY best describes the "Flite File" designed by Beech Aircraft Corp. Small enough for the VFR lightplane pilot, yet large enough for complete IFR reference data, plus many extras, the outstanding feature of this alligator-grained 18x4x11 inch case is the actual file design which tabs charts and plates for fast selection. From Beechcraft dealers, $26 the case alone; $75 with full accessories less U.S. Coast & Geodetic navigational aids.

THE PAUSE THAT REFRESHES would be enhanced by a set of these classic Collins glasses imprinted with early racing planes. Latest in Air Associate's historical series, these 10-ounce glasses come in sets of eight, accompanied by a 16-page illustrated pamphlet entitled "The Racers". Packed in corrugated carton suitable for mailing; at your local fixed base operator, for $4.95 the set; or send order to Air Associates, Teterboro Airport, N.J. for execution.



HANDY IS THE WORD for this practical little item—the "M-3" Wall Chart Plotter. Its retractable steel tape unwinds as a ruler for measuring distance in statute miles on sectional, WAC or planning charts. Reverse side is imprinted with a list of useful pilot information. Of clear plastic, the protractor fastens to the wall chart by a simple wood screw. At $4.95: Parmele Navigator (Agenair Service), 1824 Middle Rd., Bettendorf, Iowa.



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D-Day for the SST

(Continued from page 22)

to produce a so-called SST. . . . flying at an alleged 2,000 mph."

Sir George's countrymen are espousing this philosophy, and so are the French, for good reason. England would love to regain a lead in the commercial jet field it held before the untimely "Comet" catastrophes in the early '50s. France, whose popular Caravelle jet liner is gaining a spot in the international market, seeks to perpetuate an aeronautical rennaissance which has all but rubbed out her postwar reputation as a "nation of prototype builders."

Delegates to the 24th Salon International de l'Aeronautique in Paris last May got a glimpse of several proposed SST models, including the proposed Mach 2.2 "Super Caravelle," now considered the most likely to succeed.

The model is one of several under study by Sud Aviation (builder of the Caravelle) and Dassault (builder of the Mirage IV supersonic bomber).

Already, the French government has put up $2 million for a feasibility study on the medium-range (about 2,500 nautical miles) SST. The award was based on a study by Institute du Transport Aerien, a non-government organization.

"Marriage between the companies depends on the government putting up the dowry," a SUD official said. With adequate government financing these companies could put a prototype in the air by 1964, the spokesman estimated.

Britain also aspires to a commercially supersonic future. British Aircraft Corporation received a $1 million SST feasibility study contract from the government in 1960, and engine studies were placed with several other firms.

Britain's proposed SST—believed to be dubbed the Bristol 198—is designed to fly the Atlantic at Mach 2.2 to 2.3, carrying about 120 passengers. The plane has a narrow delta wing and six engines, probably turbofans. Made of aluminum alloy, the sharp leading edges, air-intakes and other parts subject to extreme heat, will probably be steel.

Other experimental projects may well have been designed to give the British valuable SST data. In October of 1960 an SB5 airplane was modified to a wing sweep of 69 degrees, and the configuration was to be tested in a series of trials. In the summer of 1961, the Bristol 188 supersonic research aircraft, under development since the early '50s, was rolled out at Filton preparatory to flight tests. Both projects could produce data valuable to an SST program.

Said Sir George: "1,500 mph is the most practicable and sensible speed at which to aim at this time. By virtue of a lot of concentrated work the British just about know how to do the . . . Mach 2 plane, and have every intention of doing it."

Thus Britain and France—at least ostensibly—favor the Mach 2 SST for a couple of good reasons:

First, the "bird in the hand" Mach 2 plane is within the state of the art and would be easier to manufacture than the "bird in the bush" Mach 3 SST.

Second, the "slower" SST would be well-suited to shorter European routes. One block-time comparison showed that a Mach 3 SST could make a 3,000-mile hop only 30 minutes faster than a Mach 2 plane, and save only 20 minutes on a 2,000 mile junket. Reason is, nearly 700 miles of either trip would be used in climbing to and descending from altitudes where the SST could fly at design speed. Both climb and descent must be made at considerably lower speeds.

But airline executives concede that the faster Mach 3 SST would have a clear-cut decision on routes of 3,000 miles and over. "Operation would be more economical and we'd save appreciably on flight time on longer trips," an airline executive pointed out.

Most telling argument evoked by Mach 3 proponents, however, is for future SSTs. Their argument: "As long as you're going to build an SST, you may as well go all the way. Mach 2 to 2.4 transports must be made of aluminum or aluminum-alloy. They would have no growth possibilities, since these metals can't stand up to higher temperatures. A Mach 3 transport, built of steel or possibly titanium, could eventually be made into a plane capable of Mach 4 or possibly higher."

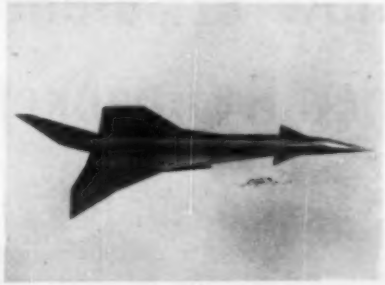
Regardless of who's "right," the flurry of action on the SST front points up a hard fact: the United States will have to make some important SST decisions, and soon. Decision day for the SST is close at hand.

Progress has been understandably sporadic, due to the complexities of the SST itself. Spurred by development of supersonic fighters in 1954 and the B-58 in 1956, the U. S. government authorized an Air Force study requirement for an SST several years back. This year the program was given impetus by a request from Federal Aviation Chief Najeeb E. Halaby. He wants $12 million to study SST engine and airframe development in fiscal 1962, and a $37 million appropriation the following year. Concurrently, FAA has launched a study to measure effects of sonic booms.

The House passed a bill to appropriate only $11 million for fiscal 1962, and recommended FAA not spend over $20 million during the first two years of the study.

Hearing this, Halaby indicated the U. S. might well send a man to the moon before flying an SST to New Delhi at Mach 3. His advice to the Senate subcommittee: it may be best not to conduct the study at all if it has to be done within $20 million limit.

Halaby's lament seems justifiable. Everyone concerned agrees that Uncle Sam must help foot the bill (estimated at from $500 million to $1 billion) needed to build the SST.



Douglas SST Concept.

Giants of the industry, Boeing, Douglas, Lockheed and General Dynamics (Convair), have already dipped into their own coffers to defray some initial design and study costs. But none can go it alone.

Not that the airlines themselves are in a big hurry to amortize the cost of an expensive fleet of SSTs, estimated to cost $15 million to $20 million each. Debts on subsonic fleets aren't expected to dip to

(Continued on page 62)

BASIC TECHNICAL ADVANCES which already have been made in fields where there is applicability to the Supersonic Transport were discussed at the annual symposium of the Society of Experimental Test Pilots in Beverly Hills.

Among the areas discussed were advances in control systems of the type which will be required for a Mach 3 transport. They now are being fitted to and will be tested on the NASA and Air Force research vehicle X-15. Also outlined were the advances in several areas of Mach 3 flight which will be afforded by the B-70 airframes which are due to fly within a year.

Operational problems begin to shape up when the Mach 2 Hustler bomber is in flight test on cross-country trips, according to one paper, exposing parts of air traffic control which will have to be changed to keep up with the airplanes. Sonic booms, which form a very touchy part of the SST operations, also were discussed, with data gathered by NASA given in a paper on measurement and effects of the booms to people on the ground and airplanes in the air.

The problems of certification and testing the SST were the subject of a session which also heard a presentation on supersonic penetration of thunderstorms as done by USAF in a research program. Generally, the agreement was that since experience is and will be so limited in Mach 3 flight that both the airplane and the conditions under which it operates will have to be evolved together so that the vehicle and its operators do not suffer any untoward penalties.

Funding and management of the SST development program was a panel topic in which it was agreed by airline, airframe, NASA and military representatives that a three-way effort will have to be made, but that private industry still will be the backbone of whatever effort is made. It was agreed that there will be two models at the most, if that many, and that passenger comfort will be a prime consideration regardless of what size and or speed the transport is capable of attaining.

FAA Administrator Najeeb Halaby touched on several areas of SST as well as current programs in a luncheon talk, indicating that the current funding for the SST will largely buy paper studies of aspects of the program.

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(Continued from page 60)

$1.1 billion till the end of 1962; then short-medium range equipment will push the debt up again. Accordingly, experts see 1966 or later as first opportune time to start taking SST purchases seriously.

Even then, competition will likely be dogged, for airframe manufacturers foresee the need for only a limited number of SSTs at the outset. Most envision a need for from 50 to 150 planes during the first few years SSTs are available. The most optimistic estimate by an airframe manufacturer: 300 to 450 SSTs by 1975.

United Research Institute, conducting a study for FAA, said the United States will require about 75 SSTs in 1970, and 116 by 1975. This is based on the assumption air traffic will jump to 64.2 million passengers in 1975.

These "optimistic" figures must be tempered with the fact that, despite an all-time high of 44 million air passengers last year, a lot of empty seats are beginning to appear on big airliners. Reason: the increased daily carrying capacity of jets, which make roughly two coast-to-coast trips while slower piston planes are making one. By the same token, SSTs will have daily carrying capacity about four times that of a Boeing 707, a Douglas DC-8, or a Convair 880. With subsonic jets and piston planes around for some time to come, there probably won't be too great a demand for the new fast-flying giants.

This fact may have prompted R. V. Carleton, senior vice president of Braniff International, to tell members of the International Air Transport Association, "For the first time in the history of aviation an excellent opportunity is afforded to go from a position of comparative financial security to complete bankruptcy at supersonic speeds."

So while it is true that airlines are "in no abiding hurry," as one spokesman said, to buy SST fleets, history has proven that they will be ready to buy when the time comes, simply because people will be ready to fly in them.

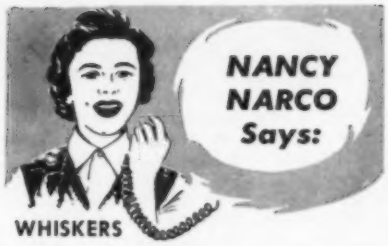
But in order to have safe, relatively economical SSTs ready for airline use by 1970—and probably more important, to put the first SST on the world market—the United States must act swiftly. The problems that must be overcome, the flight data that must be accumulated before the first paying passenger steps on an SST, are in a word, awesome.

The NASA is spending 15 to 20 per cent of its effort on SST development.

And at this writing invitations for SST study proposals were set to go out to airframe and engine manufacturers. The Air Force is preparing specifications for a Mach 3 SST with a 200-foot fuselage and a 100-foot wingspan.

The supersonic transport, FAA warns, must be able to offer economy fares and be content with low revenue-per-passenger-mile. FAA spokesmen indicated recently that fares yielding almost one cent less per passenger mile over present transports should become the standard of SST operators, and this must be accompanied by an all-around efficient system of airports, traffic control, weather forecasting, and communications. Particularly, SSTs

(Continued on page 64)



Ever noticed that some airplanes have so many antennas that they look like porcupines while other ships equally well equipped with radios are relatively bare of whiskers? You can have as many as nine different antennas on an airplane with an ADF and a 2½ COMM/NAV system with glideslope. And you can have as few as five to operate the same equipment. How come?

From a pure electronic point of view, it's best to have a separate antenna for each VHF receiver and transmitter. But from an aerodynamic point of view, it's desirable to cut down the number since it's estimated that the usual whip antenna costs about half a mile an hour at 180 mph and presents ice and noise problems, too. So, if you eliminate four whips, you gain two mph which adds up in a year's time. Besides, your nice clean airplane looks better.

This leads to the common practice of using a single antenna for several receivers or transmitters. With transmitters there's not much problem in this respect; all you do is add a relay or two. But with receivers, if you put a perfectly balanced "Tee" in the input to feed two receivers, you actually cut the input to either receiver in half, except that one or the other of the receivers usually gets more than its share. However, because of the nature of VHF, this isn't critical except under certain very marginal or unusual conditions since VHF communications don't depend on a lot of signal anyway.

Net result? Using one antenna for several transmitters or receivers does increase the number of relays and soldered joints, and adds complexity to the wiring which could increase the possibility of malfunction.

With a separate antenna for each transmitter and receiver you have higher performance and a less complicated electronic system, but more clutter and drag, and vice versa.

While on the subject of antennas, we're often asked about the nice big shiny aluminum antennas you see on Lodestars and the like. These are known as broad band VHF antennas and are designed to provide fairly uniform performance over a wide frequency range. When you start operating over a spread of 18 megacycles—like 118 to 136 mc—it is possible, with a whip antenna, to get as little as half the performance near the top and bottom of the frequency spectrum as compared with the performance around the middle of the band.

The broad band antenna provides much more uniform transmitting power and receiver input. But, once again, since VHF communications aren't so dependent on sheer numbers of watts, this is not too much of a factor and the whip antenna, being so much lighter and less expensive, is quite satisfactory for operation with the new generation of 90- and 360-channel transmitters on the market like the NARCO Mark 5, 7 and 10.

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(Continued from page 62)

will have to be compatable with subsonic transports, although indications are that a fourth layer of traffic control would be put into effect at altitudes above 40,000 feet.

An estimated 12 million engineering man-hours will be required to design the SST, and only a fraction of this total has been expended to date. Magnitude of this task is revealed by the fact that this many man-hours is twice that spent on the subsonic jets, and 15 times that spent on a piston-driven airplane like the DC-6.

At the same time, two words are of paramount importance to the airlines: customer acceptance.

"I don't think the public will go for anything as advanced as a supersonic transport that hasn't been thoroughly tested out," said R. J. Patton, who heads up the SST program at Fort Worth Division of General Dynamics.

"When manufacturers started planning today's jet airlines, they could refer to some 25,000 hours of flight records logged by comparable jet bombers," said Lt. Col. Richard Doom, 43rd Bomb Squadron at a recent SST Institute of Navigation symposium in Fort Worth.

At present, he said manufacturers have fewer than 1,000 Mach 2 hours put in by the B-58 Hustler, and only a few minutes of Mach 3 time. The latter, of course, was put in by the X-15 in short dashes over the California desert—hardly enough on which to establish firm flight standards.

Consensus is that an absolute minimum of 10,000 hours of flight experience are needed to teach engineers about reliability of structure, navigation, traffic control and many other aspects of high-speed flight. With bad luck, the time could conceivably be doubled.

"You just can't shake down an engine on less than 10,000 hours," one design engineer emphasized.

To establish a general confidence that a normal safety level has been reached in the SST, airlines must further allow for: a minimum of one year's operation, including exposure to a fair sample of operators' personnel, facilities and procedures; experience in a wide-range of climatic conditions during flight and maintenance; perhaps maintenance of several planes over a number of maintenance cycles; and collection of enough statistical data to support introduction of the SST into service.

From a time standpoint, it further matters greatly whether we're aiming for a Mach 2 or Mach 3 airplane.

EXISTING materials will likely be all right up to Mach 2.4. But if the United States elects to build the Mach 3 SST, titanium or steel alloys on the market today would probably have to be used. Although these metals have been used successfully on some supersonic fighters, no one knows how these materials are affected by sustained flight at high temperatures. The only way to find out is by simulated flight.

One expert, assuming the SST would be intended for a lifetime of some 30,000 flying hours, suggested it would take at least three years of day-and-night testing to duplicate the fatigue stresses the metals would be put to in flight.

The subject is one of grave importance. For many still recall the ill-fated Comet crashes that took 80 lives in 1952. Cause: metal fatigue.

Other thorny problems must be resolved before our engineers can plunge headlong into the task of designing an SST.

One basic question still unanswered: Will the noise level, or sonic booms, created by an SST, make it impracticable for the SST to operate over populated areas?

MANY experts think it will. John Larsen, of Trans World Airlines, said during the recent SST navigation symposium: "the supersonic transport will produce a much more intense boom than anything now flying." Bo Lundberg, a Swedish expert whose paper was presented at the same symposium, remarked, "If an SST flys, never before in history would so many have been disturbed so much by so few."

Few U. S. engineers agree. Most think that the SST's lofty cruising altitude—in the neighborhood of 70-80,000 feet—will cause the conical boom to dissipate before reaching the ground. When it reaches human ears it will sound no more menacing than the rumble of distant thunder.

Still, the problem must be resolved to the satisfaction of manufacturers and airlines before we can get on with the show. Fortunately, FAA plans to start using a B-58 Hustler, plus a fleet of fighters, to collect data on the boom starting this summer.

Collection of a vast number of Mach 2 and 3 flight hours, however, is still the main problem. And only a handful of worthy suggestions have been thrown into the hopper to date.

The North American B-70 will eventually be called on to provide experience in the Mach 3 regime. Accordingly, the company has proposed that several Valkyries, equipped perhaps with 36 seats, be superimposed on airline operational environment in a high-utilization program to build supersonic flight time.

But the B-70, constantly victimized by the battle of the budget, may be several years getting off the ground. Only last April, a vacillating congress reduced the program to two prototypes. At this rate, the B-70 may have a hard time meeting its first-flight date in 1963, and amassing 2,500 supersonic flight hours by 1969 may be even more of an ordeal.

General Dynamics offers a transport program utilizing the supersonic experience of the Hustler. According to Patton, the B-58 could be used by National Aeronautics and Space Administration in comprehensive tests at Edwards Air Force Base to investigate various aspects of commercial flight. This would include all flight phases, including the enigmatic sonic boom.

However, to provide real experience for a new transport, General Dynamics proposes a bigger, faster version of the B-58 capable of cruising at Mach 2.4.

"This airplane would be competent to carry the American flag into foreign airports for prestige purposes," Patton explains. "Practically, it will provide supersonic cruise hours to insure a safe knowledge of the environment."

(Continued on page 66)

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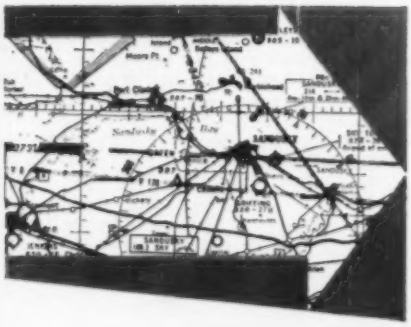

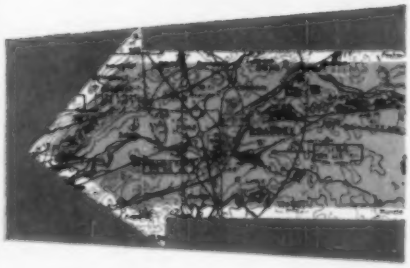

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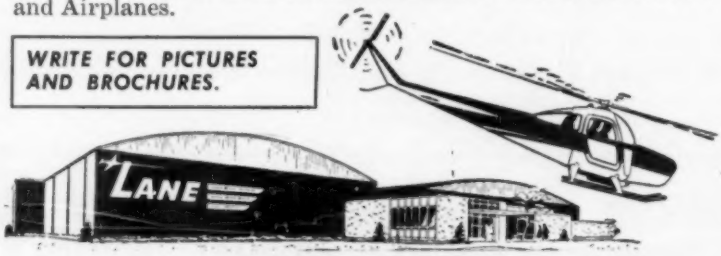

OVER 30 YEARS IN AVIATION

LANE Aviation Corporation

COLUMBUS, OHIO BE 7-3747 MUNICIPAL AIRPORT

(Continued from page 64)

Purpose of the program is to fill the vital time gap between now and 1965, when the B-70 will presumably start gaining Mach 3 flight time. Both programs could then feed supersonic time into the SST program at an accelerated rate.

"This way," Patton points out, "we could get the data required to build an SST in a hurry."

Most authorities agree with Boeing President William M. Allen, who feels the time required to build an SST may depend on the research done before construction of a prototype begins.

"If the time factor is too greatly compressed," he said, "there will be insufficient room for discovering errors and making adjustments in production. If we wait too long, we may see our national position in this field deteriorate very quickly. Technical judgments on the timing of a start are critical."

The threat to U. S. dominance in commercial transportation in the present decade was stressed by Brig. Gen. Paul T. Preuss of FAA. Eighty-five per cent of piston and turbine air transports in use by free world airlines in 1960 were made in United States, he said. "Challenged in the early 50s, the United States entered 1960 with only 34 per cent of the turbine-powered transports of the Free World manufactured here. We will be fortunate to raise the 34 per cent to 50 per cent. Not even the most optimistic is looking for a figure in turbines we had in pistons."

"In the event the United States does not develop a supersonic transport on a timely basis, it must be expected that its present position of world leadership in the area of commercial transports will be lost," he said.

That's why, in a very real sense, decision day for the SST is close at hand. END

Helicopter Airline

(Continued from page 45)

the copter with butterfly nets, baseball bats, etc.

The cartoon had the desired effect, apparently, for the decision was finally made that the new airline could establish a heliport at the north end of the Ferry Building next to the plush new World Trade Center.

Scarcely more than a month after starting service—a month in which the line carried 3,000 passengers—tenants at the World Trade Center complained of the noise of the helicopters. The San Francisco Port Authority checked the noise factor, sided with the tenants and told Bagan either reduce the noise to the tenants' satisfaction within 30 days or his contract would be terminated.

After the initial shock of this announcement, Bagan hired a sound engineer to analyze the problem. With a decible meter the helicopter sound was measured as an S-62 rounded the corner of the building and landed. The reading was high. Just as the group was discussing this and what could be done about it, a truck rumbled by on the adjacent elevated "Skyway." The decible meter needle shuddered and wavered up to a reading even higher than that caused by the helicopter. Embarrassing it was, and the matter was dropped.

(Continued on page 68)

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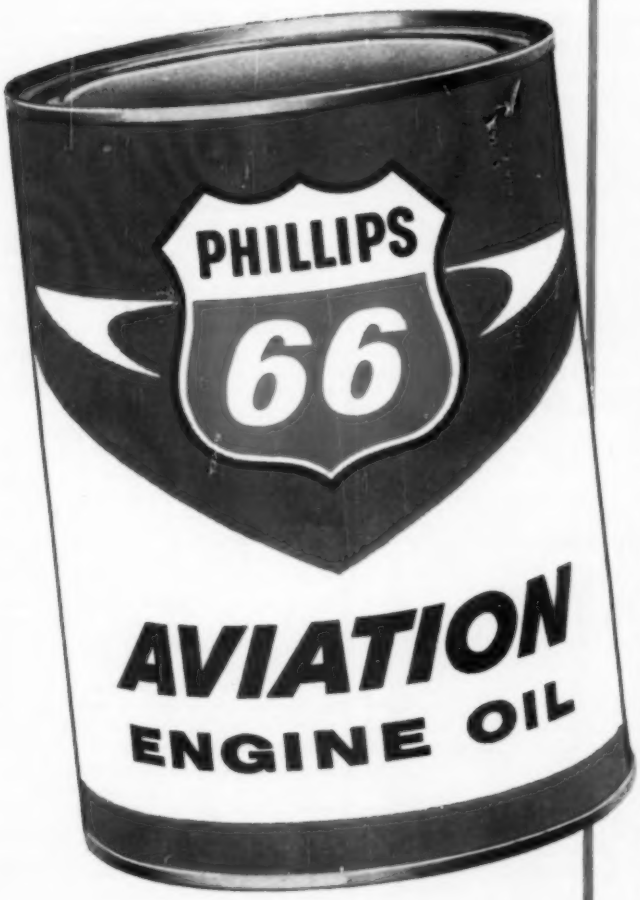

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Here are the sounds of the last of the great piston engined planes, those fantastic aircraft that turned the tide in the Second World War. The P-39, P-51 and F4U4 fighters firing up, taking off and zooming low overhead. The B-25, A20A running through their paces. A B-17 preflight check list and take off recreate the drama and excitement of a raid over Germany. All these sounds recorded in finest high fidelity and stereo.
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(Continued from page 66)

Since its rocket-like takeoff on June 1, San Francisco & Oakland Helicopter Airlines hasn't reduced power setting. Initially, it was figured that a 38 per cent passenger load factor would achive the break-even point. The national average load factor on the subsidized scheduled helicopter lines is 51 per cent. SF&O averaged 20 per cent load factor in its first month of operation.

The airline has been averaging a daily "walk-on" traffic of 125 passengers. This will have to just about double to meet the break-even point. And it will, Mike Bagan says firmly.

The basis for Bagan's assuredness is twofold: the fare and time schedule and upcoming airline joint-fare agreements.

The fare and time schedule offered by the company with its 90-mph Sikorsky helicopters includes: San Francisco Airport to Oakland Airport, $7.50, eight minutes; San Francisco Airport-Downtown S.F., $6.50, eight minutes. (Taxicab fare—$7.50 from airport to downtown); S.F. Downtown-Oakland Downtown, $6.50, five minutes; Oakland Downtown-Oakland Airport, $4.00, four minutes; San Francisco Airport-Berkeley, $8.50, 12 minutes; S.F. Downtown-Berkeley, $7.50, five minutes.

A recent agreement was made between the helicopter airline and Trans World Airlines that will offer TWA passengers free helicopter transportation between Oakland and San Francisco Airports when traveling as far as Kansas City or beyond.

Other TWA ticket holders will be offered reduced fares on the helicopter service: San Francisco Airport to Downtown S.F.—$3.00; S.F. Airport to Downtown Oakland—$4.00.

The Civil Aeronautics Board has been asked to approve the proposal which was announced jointly by Mike Bagan and L. P. Marechal, TWA's vice president in charge of sales. Marechal points out that this is a move toward "solving the time-consuming road trips between airports and the passenger's ultimate destination in business and residential districts."

If other airlines follow the TWA lead, the break-even daily passenger load of 280 will be easily accomplished within 30 to 60 days, according to Bagan. At the same time, it will take from three to five months to put the airline in the "black."

Aside from the joint-fare proposed agreement, another aid to the passenger has been in effect since the start of the helicopter service and that is a reciprocal agreement for through ticketing and baggage checking (regular weight allowances) with American Airlines, United Air Lines and TWA.

For the tourist SF&O offers a $10 round-robin flight-seeing ride from any of the pickup points on the schedule, but on a space-available basis only. Points of interest to be seen include Yerba Buena and Treasure Islands at the midway point of the San Francisco-Oakland Bay Bridge, Alcatraz, Candlestick Park and, of course, the downtown areas of both Oakland and San Francisco.

Looking ahead, Mike Bagan already is anticipating addition of larger equipment such as the Sikorsky S-61L or Boeing-Vertol 107. CAB certification will be required for the airline to operate the larger, heavier—more than 12,500 pounds—helicopters. Until that time, certification is not necessary. When it is, Bagan is sure that the CAB will grant certification or exemption, since the line is not subsidized.

The passenger-subsidized helicopter airlines at New York, Chicago and Los Angeles are costing the taxpayer more than $10 per passenger, reported Senator Richard B. Russell (D., Ga.) of the fiscal year ending June 30, 1961. The total passenger subsidy is $5 million.

By the same token, it is to the credit of Mike Bagan that he has had the foresight and capabilities to get a non-subsidized scheduled service into successful operation. It almost goes without saying that the eyes of the world—the helicopter world—are on San Francisco & Oakland Helicopter Airlines, eagerly watching for the signs of successful non-subsidized operation that may establish precedent world-wide. END

The Ill Passenger

(Continued from page 46)

can lead to hemorrhage or oozing of serum from the linings. Hearing can be seriously handicapped and the filling of the middle ear with fluid may persist for many days or weeks.

Air is sometimes deliberately introduced into the spaces around the brain and spinal cord, during diagnosis of certain brain conditions. It is unlikely that such a patient would be travelling by air shortly after such a procedure; but extreme caution is needed in such cases since during aircraft climb the expansion of air within the brain spaces would cause serious pressure on the brain tissue. A period of at least two weeks should elapse between such a test and any air travel. The same applies to a patient who has had air introduced into the anterior chamber of the eye.

An unexpected though not serious difficulty that can occur without warning is the slow expansion of gas at the root of a diseased tooth or under loosened fillings, during climb to altitude. This can be corrected by descent to more comfortable levels of flight. At times, the location of this dental pain can confuse it with sinus pain; but usually the latter is not present on climb and is worse during descent.

A passenger inclined to motion sickness should be thoroughly briefed on the means of controlling it. In small aircraft where some of these measures cannot be applied to the passenger and where turbulence is more noticeable, the motion-sensitive passenger should be prepared by the preflight use of motion-sickness preventives; but during the flight, he should not be depended on for navigational or pilotage procedures which involve mathematical calculations or quick observations.

Passengers with a history of breathing difficulties, such as asthma or former heart failure, are affected surprisingly little by air travel under proper conditions, though inexperience with flying and fear can worsen these conditions during flight. Any person who has symptoms of even mild heart failure or a recent heart attack should not fly, not only for his own sake, but to avoid serious difficulty for the pilot during flight. If a person with heart disease is

(Continued on page 70)

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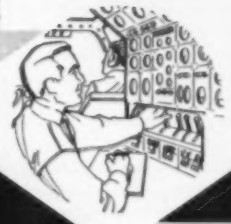

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But why deny yourself the advantages of high altitude flight. A more sensible decision after the above episode would have been, "I am taking immediate steps to equip my plane with oxygen". Then he could begin to *enjoy* the real pleasure of flying at altitudes above 10,000 feet — the smooth, comfortable altitude that gives you favorable tail winds and improved engine performance on less fuel. Up high you get clearer, stronger performance from your navigational aids — especially those limited by horizon transmission such as Omni.

Keep it in mind, Hypoxia, the lack of oxygen, gives pilots a feeling of well-being when actually their judgment is poor. Vision is impaired. Reaction is slow. Coordination is bad. Yes, even permanent brain injury is possible! So why take chances or deprive yourself of the pleasure of high altitude flight when oxygen equipment is so convenient to carry and is so reasonably priced. A letter to Regis Stevenson, Scott Aviation Corporation, Lancaster, New York, will bring you complete information.

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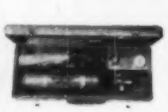

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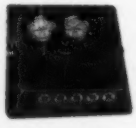

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(Continued from page 68)

able to walk 100 yards and then climb 12 steps without any symptoms, he should be able to fly in pressurized aircraft; whereas the person with a serious heart condition or with disease of the blood vessels who cannot climb one flight of stairs without getting symptoms should probably avoid all travel in commercial airliners and especially in unfamiliar small aircraft.

If air travel in such cases is absolutely necessary, special provision should be made for it, particularly by the use of air-ambulance. Persons with heart conditions who are doing well at sea-level can travel at cabin altitudes of 8,000 feet; those who have few but definite symptoms at sea level should not travel at cabin altitudes of more than 6,000 feet. Similarly, certain lung conditions, such as chronic bronchitis with enlarging lungs (emphysema) may be quite uncomfortable unless the cabin altitude is below 5,000 feet.

The frightened passenger who is unfamiliar with flying, especially in small aircraft, usually freezes and causes little trouble; but if he has fear of narrow places (claustrophobia) he should not be encouraged to enter small aircraft and oftentimes not even large commercial liners. The same may be true for persons with fear of high places. Fear may show up in the passenger as overbreathing (hyperventilation) which can produce dizziness, tingling, hazy vision, and muscle cramps. These are not due to lack of oxygen and are not especially helped by descent from altitude, if the aircraft has not been above eight to ten thousand feet. Rebreathing his own air in a paper or plastic bag may help to relieve the symptoms of overbreathing. Fear may be aggravated by the degrees of acceleration, vibration, and noise of the aircraft, requiring that the passenger be reassured about them.

The mentally ill person can become dangerous aloft and should never be taken up as a casual passenger. Epilepsy occurs in the susceptible person more easily in aircraft than elsewhere, because of the lessened oxygen and the tendency to overbreathe with apprehension. The epileptic should travel by air only when carefully advised medically beforehand.

Age alone is no barrier to air travel; infants older than one week and healthy persons of advanced age can travel without difficulty. Pregnancy should prevent the mother from travelling in commercial airliners possibly during the eighth month, and certainly in the ninth month unless medically approved otherwise. The prospective mother should not travel after the sixth month in small aircraft because of turbulence effects and the tendency to motion sickness. Otherwise, air travel is not harmful to a normal pregnancy.

Flying, other than by air ambulance or with special handling, is not advisable for persons with large tumors in the middle of the chest, large hernias, obstruction of the intestine, tumors and other conditions of the brain with increased pressure inside the skull, spinal cord injuries, skull fractures, recent strokes, and any tendency toward allergic swellings of the larynx. For the average flight, these considerations would rarely apply; yet a moment's thought about his passengers may save the general aviation pilot many moments of serious distress aloft. END

King Radio

(Continued from page 39)

figuration the *lo* sensitivity position was used to pinpoint the marker. As the light came on steady, a visual check made with the ground station verified our position directly over the beacon.

Inputs for the panel beacon indicator come from another new King item. The KR-20 marker beacon receiver antenna.

The unique KR-20 follows the King policy of single-package design and eliminates long wire antenna implacement. Mounted for the evaluation at the underside of the aircraft and protected by a molded low drag plastic case, this easily installed unit meets the FAA-ITSO requirements for selectivity and sensitivity. Guaranteed stable from −40 to +60 degrees centigrade, it contains only two tubes and three transistors and operates either on 14 or 28 volts. Weight of the KR-20 and the three-light panel implacement is under two pounds and costs $295.

We reported our position and commenced the approach.

The KI-210 Indicator paired with the KX-110 switches automatically from omni range reception to localizer and glide slope when the correct localizer frequency is tuned in. Since 10 crystal-controlled frequencies are paired with the localizer frequencies, the pilot simply twists the one dial and simultaneous tuning is accomplished. Straight line shafting prevents malfunctions that can occur with remote selector mechanisms.

The approach, and those subsequent to it were facilitated by these key features:

- The high degree of sensitivity built into the unit. Slight course deviations resulted in an immediate needle deflection. Necessary corrective action could be taken without the delay from slow indication that can disorient the pilot.
- The clear read-out of the 210 with its deviation markings for the needles and its heading selection in compass fashion around the unit.
- The automatic features that allow for a minimum of manipulation during the critical transitions that instrument flight can impose.

On the return to Fairfax the KX-110 transmitter/receiver was used from 5,000 feet for a test position report to Emporia, Kansas, at a distance of approximately 95 miles. The "loud and clear" acknowledgment of our requested radio check coupled with the fine reception in the aircraft attested to the value of King's 10 watt output, an integral part of all King transceiver equipment.

Containing a frequency range from 118.0 to 126.9 the 90-crystal controlled unit offered exceptional range with clarity. The extra wattage can make the difference in being heard or not being heard, an item of increasing importance when in competition with air traffics heavy communication load.

Tuning, in the receiver, is synchronous with the transmitter, and the adjustable squelch cuts down normal static handily. King has also added, at the pilot's option,

an isolation amplifier for ultra clear audio output and a power supply modulator unit that is completely transistorized and has a line filter further minimizing radio interference.

Throughout the King line the transistor power circuit plays a key role. King feels the transistor can be more easily packaged than the printed circuit card since vibration will not affect its operation. It also has proved to be a relatively trouble-free item.

To further protect its customers, King dealers are carefully screened and must be FAA approved or have special testing equipment available to them to thoroughly service any King equipment that they sell. All aircraft radio sales are handled through 173 King dealers in the United States, Canada, South America, and Europe.

The KG-300 unicom is the only piece of equipment handled by King for direct customer sales.

King firmly believes in offering only fully tested equipment to its expanding market. In the shop area of the Olathe plant engineering's ideas are first proved out. After shop testing, 10 of the new units are placed in the field at installations like the Aeronautical Engineering Department at Kansas University. There in use during a four or five month period, the design, durability and function of components is evaluated daily.

KING RADIO EQUIPMENT

KY-90	Transceiver—90 channels
KY-95	Transceiver—360 channels
KR-40	Nav Receiver—Omni and localizer
KN-50	Nav Receiver with built in 10 channel glideslope receiver
KX-100	Navcom unit—(KY-90+KR-40)
KX-120	Navcom—360 channel
KX-110	Navcom ILS package
KX-130	Navcom ILS 360 channel
KI-200	Omni localizer converter indicator
KI-210	Omni localizer glideslope converter indicator
KR-20	Marker beacon receiver
KG-300	Unicom

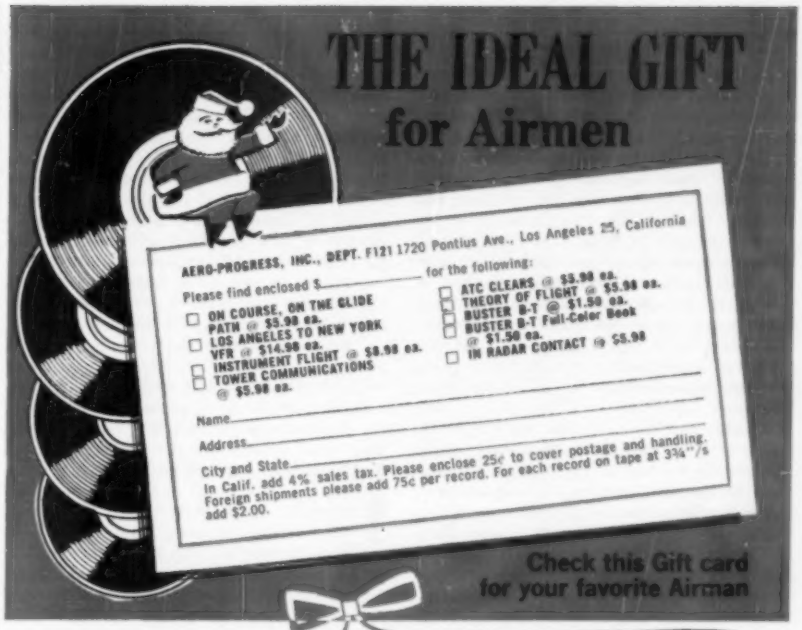
Although King Radio is geared to the private and business operator, commercial installations have been made in DC-4's and 6's of South American cargo air lines.

As King Radio grows, its ideas expand with it. The pride of King is its new 360-channel transceiver with 50-kc spacing. It is a part of a complete IFR package with omni and ILS and priced in the $4,500 range.

King also plans to place a DME on the market below $2,000 by mid-1962.

The degree of quality King builds into its units was measured, in part, at each factory workbench in our tour of the King plant, the degree of performance was proved in the evaluation flight.

King Radio is two years ahead in its planning of new equipment, and expects to enter almost every phase of the navcom field. The future of King has been assured for this development by its common sense philosophy of meeting the needs of today's pilot at a price that he can afford. END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Impact of U.S. Aircraft

(Continued from page 24)

European business aviation was due to many factors: the crushed economies resulting from the war; a psychological revulsion against aircraft in general on the part of many Europeans; the fact that, in Germany and Austria, private aviation was forbidden by the occupation authorities until 1955. In France, a resurgence of private flying took place quickly under government encouragement, but strong protectionist measures restricted it largely to French-built aircraft. In England, as elsewhere, the major aircraft manufacturers were busy competing for the transport and military markets, leaving the lightplane field in a sadly neglected state.

It was in this strategic early period, between 1947 and 1952, that U.S. plane manufacturers began their export operations aimed at a then-tiny European market. Stepping into the picture very tentatively, they at first made only token efforts at "selling general aviation" in Europe. But a gradually growing response made them realize that there was a real potential to be exploited there.

During the past 10 years, with their large variety and always-available supply of aircraft, the U.S. lightplane makers have played a major role in boosting Continental general aviation—business flying in particular—and have captured the bulk of the market in the process.

In the past two years, European economies have been experiencing a boom. As a consequence, the market for utility aircraft really has opened up and is promising continued future expansion. Piper, Cessna, Beech, Aero Commander, Bell, and other members of the U.S. industry have strengthened their European facilities and sales forces. So far, they have found relatively slight competition from European aircraft makers. Most people feel that this period of "having the field to themselves" is rapidly drawing to a close. But, as of right now, the U.S. manufacturers are doing an impressive job of selling planes and are the chief impetus behind the growth of business aviation in Europe.

Theirs is not an easy task, however; they face a welter of problems, such as import restrictions and tariffs, growing local competition and an innate reluctance by businessmen to abandon tried-and-true methods (namely, the use of the extensive European rail systems and airlines).

THE fact that they're doing as well as they are is remarkable in itself, considering the obstacles in their way.

To get a better view of the situation, lets examine the progress of U.S. aircraft sales, and their attendant problems, in England and France.

In postwar England, general aviation was an orphan. There was no business flying to speak of, and private flying was almost completely restricted to aero clubs, using mostly prewar "crates." The big manufacturers seemed interested only in developing airliners and military craft, and the old lightplane makers—Auster, Miles, etc.—experienced severe economic difficulties made inevitable by a lack of market and complicated by a marked lack of imagination. To put the seal on the dismal situation, government import restrictions, created in an effort to hold on to as many dollars as possible, made it a superhuman task to import American aircraft to the United Kingdom.

In 1955, Wing Commander Tim Vigors, formerly of the RAF and then a leading dealer in racehorses, became fed up with worsening road conditions and found his interest in aviation reviving.

His interest became more than academic. He bought a Piper Cub in the United States, to use on his many trips around England and Ireland (he bears the title of Marquis of Kildare).

His renewed flying led him to realize the potentials of business aviation and, in 1957, he formed Vigors Aviation, Ltd., and was granted the Piper distributorship for the UK. He immediately began an active campaign on behalf of general aviation and built up a small but complete spare-parts and maintenance facility. He was preparing, as he says, "for a day I knew was bound to come soon."

It came in 1959. British dollar restrictions were lifted, greatly facilitating the import of U.S. aircraft into the UK—although still leaving a 17½ per cent import duty. Vigors' two years of careful preparation paid quick dividends. By the end of 1960, he had sold 86 new Pipers and had become one of the most influential figures

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in a gradually-reviving British general aviation.

Among the many coups that Vigors has managed is selling the College of Air Training, at Hamble, on using the Piper Apache as its standard twin trainer. This means that every future British airline pilot will be trained in Piper aircraft.

Today, of a total of barely 1,650 civil aircraft in Britain (excluding airliners), there are more than 130 Pipers on the Aircraft Register.

In late 1959, just before Britain's import restrictions were lifted, Cessna appointed Airwork Services, Ltd., as its UK distributor.

"When we started, Cessna was only a sideline with us," states D. F. Burmby, Airwork's Manager. "We bought one 310, sold it, then bought another, and so on. But we soon saw the tremendous potential of the market and got down to work in earnest."

Airwork sold 29 Cessnas in 1960—six 310s, the remainder divided between the 172, 175 and 180, with the 172 and Skyhawk models the most popular. This year, the company anticipates sales of at least 60 Cessnas. Perhaps their most impressive achievment to date is the establishment of a large, modern sales and maintenance center at Panshanger Aerodrome, not far from London. "This not only gives us a fine, well-located maintenance facility," states Burmby, "it lets us cater to the new type of customer we're developing here in England . . . the walk-in customer, the man who simply walks into a showroom and says 'I want to buy an airplane.'"

Beech has been rather backward in developing its UK sales so far. But they recently appointed a new British distributor —Short Brothers, of Belfast, Ireland, and they are getting things rolling.

Aero Commander, too, has begun to move in England. Field Aircraft Service, at London Airport, was appointed UK distributor this year.

The situation in France has been markedly different from that in England. Always one of the most air-minded nations, the French began encouraging private flying soon after the war. But, by carefully erecting a wall of protective tariffs and making it exceedingly difficult to obtain an import license for foreign-made aircraft, France successfully has reserved much of the market for its own rather active lightplane industry.

DESPITE these difficulties, Piper, Cessna and Beech have been active in France quite a few years, with Aero Commander also recently entering the picture.

Jonals Aircraft & Arms Co. handles Piper sales in France (as well as in most of Europe and North Africa). There are approximately 1,200 privately owned lightplanes in France. Of this total, there are about 400 Pipers—more than 200 Cubs, mostly used by aero clubs; about 21 Apaches, a couple of Comanches and 160 other single-engine models. (Many of the Cubs are prewar or war-surplus aircraft.)

Both Cessna and Aero Commander are represented in France by Fenwick Aviation. Cessna began its French efforts in 1952, when it sold one plane. The pace was more or less steady until 1960, averaging about three per year. But last year, Fenwick sold 12 Cessnas, and another 14 by Sept. 30 at first half of this year—despite the fact that French import duties range from 29 to 50 per cent!

In 1960, Fenwick also became the Aero Commander distributor for France. The company feels there is a definite future in France and Europe for the large twin, which should be in great demand when and if normal trade is resumed between France and North Africa, because of its non-stop range, general performance, luxury, etc. Fenwick states flatly that the plane has no real competitor among aircraft now being produced in Europe—with the possible exception of the Czech-built Aero 145, for which it is almost impossible to get spare parts.

This, then, is the current situation:

There is a big boom in European general aviation. This is partly due to Europe's improved economy, but is largely because of the growing efforts of U.S. aircraft manufacturers to "hard sell" business and private aviation to Europeans. Each of the major U.S. producers has distributors active in all major European countries, and, right now, the U.S. aircraft are the most popular by far on the European market—with U.S.-made twins winning increasingly wide acceptance by business users.

The other side of the picture, for the present, is a long list of obstacles—cir-

(Continued on page 74)

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(Continued from page 73)

cumstances standing in the way of what should be a really impressive growth of European business and private flying, and circumstances that threaten to cut deeply into the U.S. manufacturers' nearly exclusive possession of the field. The main obstacles are: tariffs and import restrictions; local flight regulations prejudicial to growth of general aviation; consumer reluctance, and rising local competition.

Tariffs and Import Restrictions: As always in Europe, the tariff situation is muddled, with each country imposing a different duty on imported aircraft, as well as varying import restrictions.

France, eager to protect its own industry, has erected the highest barriers. Taxes on incoming aircraft range from 29 to 50 per cent, depending on weight, and difficulties of obtaining an import license are enormous, requiring the prospective customer to offer justification to the Ministry of Aviation as to why he must have an imported plane rather than a French one.

As a further protective measure, the French government offers a form of subsidy to its industry and its customers. If a buyer purchases a French plane, not only does he avoid the huge import duty and the complicated procedure of getting an import license, he is also eligible for a discount ranging from 50 to 80 per cent of the list price! This huge discount is subsequently made good to the manufacturer.

In England, import restrictions were lifted in 1959. But there still remains an import duty of 17.5 per cent. Thus, a Piper Colt costs about $7,500 in England; a Tri-Pacer with VHF and VOR, about $17,000; a Cessna 150, without radio, about $9,980 and a 180 nearly $19,000.

Germany, Switzerland, Austria and Italy offer no import restrictions. But their import duties range from a high of 28 per cent in Italy to an almost negligible four per cent in Switzerland. (Business aviation in Switzerland is slight so far, with only five companies using the services of professional pilots. But there are some 550 privately owned aircraft, of which about 80 per cent are U.S.-built—mostly in use by the aero clubs. Gas and insurance costs are very high in Switzerland, as the government offers absolutely no concessions to private aviation.)

Prejudicial Regulations: In nearly every European country, one hears the repeated complaint that government regulations are being promulgated to favor the airlines and keep business and private aviation down. And thus far, general aviation here lacks a strong enough centralized voice to carry much official influence.

In England, for example, business aviation is greatly hampered by the lack of a good, all-weather airport near London. This alone is enough to discourage many prospective business users from getting into the air. (A slight concession was made, recently, when London Airport was declared open to privately owned single-engine planes, provided they are flown by a rated pilot, fully instrumented, and "adequate prior permission" is obtained. But this is only a slight help, at best.)

In most of Europe, night flying is automatically IFR, and in many cases IFR operations are restricted to twin-engine aircraft. This, too, is a serious discouragement to private owners, with the exception of Denmark, which recently permitted single-engine IFR (see FLYING, June 1961).

Germany presents the most dismal picture, in this respect. There, for IFR operations (which include night flying), a plane must have: twin engines; a crew of two; full gyros; two sensitive altimeters; two VORs and one ADF (or vice versa).

Because of such restrictions, many authorities feel that the big future for U.S. aircraft in Europe lies in twin-engine models, fully equipped. Only these can give users all-weather potential.

Turboprop conversions of standard business aircraft is a growing trend in Europe; this will be fully discussed in the next section of this article.

Fog

(Continued from page 37)

next to the glass is cooled to the point where it cannot hold all its invisible water vapor, and so the vapor is squeezed out of the air into visible form.

A clear, calm night (especially near the center of a high pressure area) provides good conditions for ground fog. After sunset, the earth cools and with no cloud blanket to hold in the heat, it "radiates" to the upper atmosphere. Calm or gently moving air comes into contact with the cold ground and is chilled to its "dew point," whereupon fog forms. In such cases the air temperature several hundred feet above the ground will be warmer than at ground level and you have an "inversion."

Maximum density of ground fog generally is reached shortly after sunrise. Then heating of the ground increases the temperature of the air at low level, and the fog begins to evaporate. When fog forms in a smoky area, the smoke-fog combination (called "smog" when thick) can become intense and persistent. It can completely hide industrial cities (and their airports) and continues even after country fog has fully dissipated.

"Advection" fog forms when warm, moist air blows over a colder surface and the lower air is chilled to its dew point. Opening your refrigerator door creates advection fog when warm room air comes in contact with cold surfaces inside the icebox. In winter, with land colder than ocean, moisure-laden winds moving from the sea bring advection fog hundreds of miles inland.

A specialized form of advection fog is known as "upslope" fog. Air moving westward from the Missouri River flows from 1,000 feet up a slope to 5,000 feet at the base of the Rocky Mountains. As it moves higher up the slope, it cools. If the air mass contains sufficient moisure, large areas of fog will form. On the east slopes of the Atlantic Coastal Plain the same thing can happen when southeasterly winds blow—in fact wherever moist winds blow upslope.

Widespread fogs can be caused by fronts, especially by winter warm fronts. With moist air overriding a cold air mass, each warm raindrop falling through the cold air below acts as a tiny "teakettle on the kitchen stove," evaporating some of its liquid into the cold air. When the

air becomes saturated, fog and low stratus appear.

One basic fact stands out whenever any type of fog is discussed: Moisture is the friend of fog, and heat is its enemy.

If there were some way to introduce heat into a fog situation at an airport, the fog would evaporate, since a specific volume of warm air can contain more water vapor than the same volume of cold air. World War II experiments along this line, known under the code name "Fido," were successful to a degree, but the project finally was shelved. In these experiments a number of gasoline fires were ignited along each side of a selected runway. The resulting heat literally burned the fog away in the vicinity of the fires and provided a dramatic but expensive view of the runway.

Another enemy of fog, though to a lesser degree than heat, is wind. Wind velocity is important, not so much for its horizontal velocity but because of the vertical currents which result from the friction between air and the earth's surface. The higher the velocity, the greater the effect of the turbulent vertical mixing. Ground fog will be unable to form in winds of seven knots or more as the mixing destroys the upper inversion. The maximum frequency of advection fog is observed with light to gentle winds. Winds in excess of 12 to 15 knots are sufficient to lift fog off the surface to a low stratus deck. Upslope fog, however, is one of the few types which can maintain themselves in high winds, as high as 25 knots.

If we begin to think about fog in terms of moisture, temperature, and geography, some important features appear in Fig. 1 and 2. Note that both show an absence of fog and IFR conditions in the Western Mountain and Southwest area. Why? Obviously it must be a lack of moisture.

Fig. 2 is a chart of winter IFR conditions (December, January, and February) and it is interesting to find that all other seasons show less IFR weather—a confirmation that winter is the worst season of the year for pilots.

With Fig. 2 as a guide to winter IFR, we can briefly discuss how fog contributes to such conditions. In the Pacific Northwest relatively warm, moist sea air moves inland over cooler ground. This air must also lift over the Coastal hills and the Cascade range further inland. Winter cooling, plus the 30 to 40 inches of rain in winter, give excellent fog conditions.

Inland valleys exposed to sea air develop "Inversion" or "High" fog when the air mass stagnates and is subject to a long period of cooling. This type forms as a stratus deck at the top of a moist layer of air and builds down toward the ground, lifting in daylight hours and lowering to fog at night. High-inversion fogs are the most persistent and tenacious to be found anywhere in the United States. They may continued without interruption for several days and in extreme cases, for several weeks.

In the Southeast and Gulf Coast states both warm and cold fronts are usually slow-moving or stationary, which accounts for much of the fog and rain in that region. The Gulf Coast also is noted for a combination of advection-radiation fog

(Continued on page 76)

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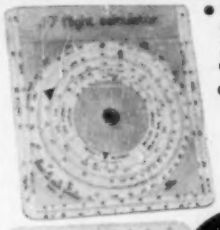

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(Continued from page 75)

which extends 150 to 250 miles inland. The advection comes from Tropical air moving over cool ground with night radiation lowering the ceiling and visibility.

Industrial smoke and haze contribute greatly to the Ohio Valley's high percentage of IFR even though fog usually receives the blame. The Pittsburgh area has the highest percentage of IFR weather in the United States, which means the worst weather. However, Pittsburgh boosters can take heart from the fact that they have better winter weather than airfields in Northern Europe.

Some persistent ground fog and valley fogs are caused by the amount of sunlight in winter. In spring or fall fog would be burned away by noon, but with less heat in winter it may only partially burn away or may reluctantly lift to low stratus by midday. In the afternoon the fog oozes back stronger than before, and the next day less fog is burned away. The cycle continues until the area is zero-zero, and a good pressure system is needed to push the stuff away.

Flight planning when fog is a possibility should include some items not normally of concern. Check the destination airport for nearby sources of moisture which may reduce visibility in the local area. A surprising number of major airports are located near rivers, coastlines, or lakes.

However different fog and haze may be, the presence of haze promotes the appearance of fog. If other conditions are favorable, a thickening haze will soon bring fog, even when the spread between temperature and dew point is as much as four degrees.

Always watch the temperature and dew point spread for your destination when the ETA is afternoon in winter. During the cooling-off hours, as the spread narrows, a fog can form suddenly over an entire area, apparently spontaneously out of the air, or sometimes as the sudden lowering of an already inadequate ceiling.

On a night flight when conditions are favorable for ground fog, make an occasional check on ground lights. The onset of fog is indicated by an indistinct or blurred appearance of the lights.

In an emergency situation when you have to stay VFR in low visibility the most helpful advice is "slow down." Instead of thinking in terms of miles per hour, think of the limit of visibility in seconds. With one-half mile visibility and a speed of 60 mph, an object at the limit of visibility is 30 seconds away. At 90 mph the limit of visibility is 20 seconds and at 120 it is only 15 seconds distant. Time lost by slowing from 180 mph to 130 while traveling a distance of 50 miles amounts to only about seven to nine minutes.

Until pilots began cross-country flying, about the only people much interested in fog were sailors and London pedestrians. Early pilots learned the facts of fog through hard experience. Merle Russell, an airline meteorologist in the late 20's and now with FAA, tells of pilots who could "smell" fog several hours before the weatherman became aware of the possibility. For those of us without this talent, a trip to the weather office beforehand and in-flight monitoring of weather broadcasts are the best defense against fog. END

Farnborough

(Continued from page 43)

lower U.K. price, will conform to the policy to use Rolls-built engines when these become available. The BEAGLE-Auster Mk. 11 also is designed to take advantage of this policy by replacing the 180-hp Bombardier engine of the Army Air Corp's standard Auster Mk. 9 with the 260-hp Continental IO-470. This modification also is directed toward improving the STOL performance of the Mk. 9, especially in tropical or high-altitude conditions. It probably will be associated with the installation of high-lift devices such as slats and slotted flaps on the projected BEAGLE-Auster Mk. 12.

At Farnborough, the Mark Eleven prototype certainly showed the benefit of the extra power as it snarled off the runway in a few yards, and was upward-rolled and hurled around with the usual vigor and finesse of Ranald Porteous. The little Terrier also aroused some interest, mainly from its very low initial price (for the U.K.) as a rebuilt ex-military type, of the equivalent of $5,600. Low selling prices also have been quoted for the two interesting projects of BEAGLE-Miles, of which details were released for Farnborough. With a generally similar airframe, the four-seat M.117 and M.218 are to be powered by single- and twin-Continental O-200s of 100 hp each, and to be sold for about $8,500 and $17,000 each, under present plans. The M.218 is being built first, and a structural test fuselage already has been completed. It is of all-metal design, although making extensive use of fiberglass plastic mouldings, and will employ a retractable tricycle undercarriage.

From the fully furnished cabin mock-up which was shown at Farnborough, the M.218 will be very roomy and comfortable, with the generous window area that is becoming the hall-mark of pilot-designed BEAGLE products. Control layout is orthodox, except for the current installation of a central blind-flying panel and a left-hand radio navcom set-up, in contrast to established practice. An interesting exhibit alongside the mock-up was a complete panel of flight instruments by the American Garwin company, which is producing "personalized" gyro equipment for the BEAGLE group. A very wide market indeed awaits the completion of the M.218 prototype next Spring, and BEAGLE already has shown with the B.206, which first flew 311 days after the start of detail design work, that they do not believe in wasting time.

THE single engined M.117 will follow soon afterwards, initially with a fixed tricycle undercarriage in its minimum-cost version, but with the M.218, is likely to be produced at a later stage with the larger 145 hp Rolls/Continental O-300 engine and a retracting gear.

Sharing the honors of initial Farnborough appearance with the BEAGLE B.206 was the equally interesting Handley Page H.P.115 narrow-delta research aircraft, which had made its first flight two days after the executive twin, on August 17. With 75 degrees of sweep, the paper-dart H.P.115 is the most advanced aircraft of its kind yet flown, although its function, as indicated by its fixed nose-wheel undercarriage, is strictly that of low-speed research. It is intended to explore the potential of the narrow-delta configuration, in conjunction with a modified Fairey F.D.2 for the high-speed end of the scale, for the supersonic transport. Its conservative handling, however, at Farnborough, where it used most of the 10,000-foot runway for takeoff, reflects the early stages reached with its flight trials.

Continuation of the general aviation theme at Farnborough was provided by other static exhibits and models, which included the first appearance of the Astazou-engined Short Skyvan II project. The prototype Skyvan I, powered by two 390-hp turbo-supercharged Continental GTSIO-520 flat-six engines, is nearing completion of Short's Belfast, Northern Ireland, factory and should fly early next year for the first time. The camouflage finish of the Skyvan II model is an indication of its projected application to the military market. With two 560-shp Blackburn-built Astazou II turboprops, the Skyvan II is scaled up from the original design, with an increase in gross weight from 9,300 to 11,500 pounds. It should carry a 4,500-pound payload for 370 nautical miles, at 140-180 knots. Another projected military development of a civil

(Continued on page 79)

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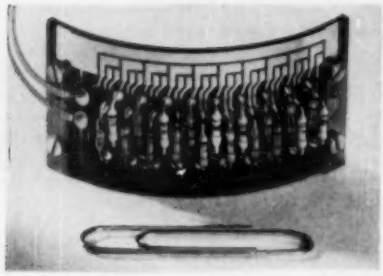

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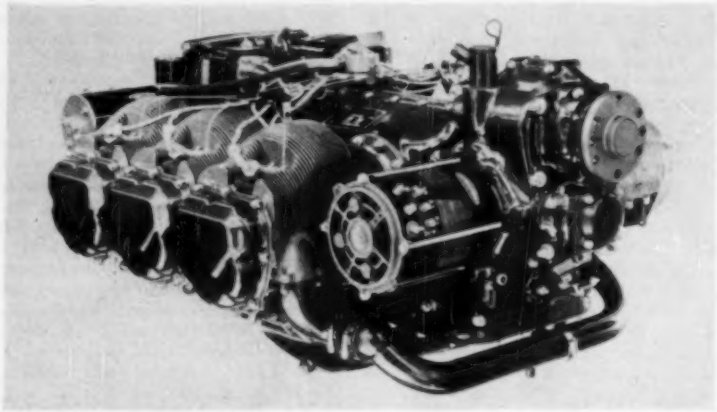

NEW CONTINENTAL UNVEILED AT FARNBOROUGH

IN THE ultra-British stronghold of the S.B.A.C. Show at Farnborough, three American engines were shown for the first time by Rolls-Royce. One of them, the 310-hp Continental GIO-470-A, a geared version of the well-known 260 hp powerplant, was making its World debut, never having been publicly shown before. It completed its type test in the United States in July, and a prototype engine, internally incomplete, was rushed to Britain in time for Farnborough.

The GIO-470 is one of three Continental engines to be built under licence by Rolls-Royce, which also has exclusive rights to distribute all piston-engines produced by the American company, together with spare parts, throughout Europe. Rolls also can sell its license-built engines in Australia and New Zealand, and has non-exclusive rights for nearly all parts of the World, except for the U.S. and some Far Eastern countries.

Apart from the GIO-470, Rolls-Royce is tooling up for two widely used lightplane engines, the 145-hp O-300-C and the 100-hp O-200-A flat-fours, in the light aircraft engine department of the company's Motor Car Division at Crewe. First production deliveries of these two engines will begin from there next year, starting with hybrid units built up jointly from British and American-made parts, and gradually increasing the proportion of licensed components until all-Rolls engines are achieved.

First indications are that a wide market awaits the Rolls-Royce/Continental consortium. A first production run of about 750 engines is anticipated, of which some 500 will be the small O-200, including about 50 of the similar C-90, and the remainder the O-300s. Most of these will probably go to the French Morane-Saulnier company, for its widely ordered but not yet delivered Rallye lightplane. This is being built to take all three engine types.

Another very good customer will be the lively BEAGLE Group, British Executive and General Aviation Ltd., whose declared policy is to power all its types with Rolls/Continental engines. Its new and attractive B.206 five-seat executive twin made its first flight in August with a pair of 260-hp Continental IO-470s, but production aircraft are to have the more powerful GIO version each developing 310 hp at 3,200 rpm for takeoff. The new GIO-470-A weighs 461 pounds dry, has a compression ratio of 8.6:1 and operates on 100/130 octane fuel. The B.206 is the first aircraft announced to use this engine.

Another Farnborough exhibit was the first BEAGLE-Auster Airedale four-seat lightplane to be powered by a Continental engine. This is the 175-hp GO-300-A, which is a Rolls-Royce supplied alternative to the original Lycoming O-360 of the Airedale. Third BEAGLE aircraft shown at Farnborough with a Continental engine was the new Auster Mk. 11, a development of the British Army's standard A.O.P. Mk. 9 liaison aircraft powered by the 260-hp IO-470.

The smaller Continental power units to be built by Rolls will be installed in two new projects now taking final shape on the BEAGLE drawing boards. Metal has, in fact, been cut for these designs, which are single- and twin-engined variants of the same basic airframe. Products of the Miles division of the BEAGLE Group, they comprise the M.117 and M.218 four-seaters, with one and two R-R/Continental O-200s of 100 hp, respectively. Both types are likely to be produced in alternative forms with the more powerful (145 h.p.) Rolls/Continental O-300 engines. They have been promised and designed for very low-cost production, the single selling for less than $10,000, and the twin planned for rather less than $20,000, f.a.f. If these figures can be anywhere near achieved, BEAGLE—and Rolls-Royce—have a large and lucrative market at their feet. JOHN FRICKER

(Continued from page 77)

transport was the military Handley Page Herald, also shown in model form, with STOL capability and rear-fuselage ramp loading.

A full-scale Herald 200 transport was flown in the display program, together with its contemporary, the Avro 748. Both were in operators' markings, and details were included of projected developments. For the 748, these comprised the Series 2, with two Rolls-Royce Dart R.Da.-7 turboprops instead of Dart Mk. 514s, and an increase in payload from 10,586 to 10,986 pounds, and the bigger 748E, also with R.Da.7s, offering accommodation for up to 60 passengers. The R.Da.10-powered 748 Super E will have a max. payload of 14,000 pounds. There is also an executive version of the Avro 748, which was the aircraft quoted as the most interesting at Farnborough by Russian aircraft designer Oleg K. Antonov during his visit to the S.B.A.C. show along with veteran Sergei Ilyushin. Antonov was taken for a flight in the 748 and was thus given the opportunity of comparing it with his own light turboprop transport, the An-24.

Herald possibilities were illustrated by models and illustrations. At Handley Page's four factories, production is well advanced on the first 25, and is now starting on the second 25, of a batch of 100 Heralds. The first 21 aircraft will remain at the current gross weight of 40,000 pounds, but a simple undercarriage modification will allow an increase in subsequent types to 43,000 pounds. Other Handley Page projects include the H.P.R.8 six-car/30-passenger ferry freighter, the H.P.117 550 mph 300-seat all-wing low-fare transatlantic transport, and a laminarised Mach 2 delta-wing airliner.

A general aviation project which is reaching the stage of recognizable hardware (although not at Farnborough) is the D.H.125 twin-jet executive transport. The de Havilland division of Hawker Siddeley Aviation featured this 500 mph eight-seater on its display stand, and is building a batch of 30 as a private venture. It has also proposed the D.H.125 to the RAF as a high-speed navigation and liaison aircraft, with a possible requirement for 50. The D.H.125 will be powered by two 3,000-pound rear-mounted Bristol-Siddeley Viper 20s, which have already been ordered, and the engine company has placed a reciprocal order for the first production aircraft for executive use.

New military aircraft were completely absent from this year's Farnborough. The only newcomer in military markings was the Armstrong Whitworth Argosy C.1 tactical transport, which flew past each day to show its crocodile-jaw rear-loading door.

Demonstration of airlift logistics was one of the highlights of this year's Farnborough flying display, which depended to a far greater extent than normal on military participation. No. 38 Group, Transport Command, air-lifted about 52,-000 pounds of equipment and 350 personnel into Farnborough in a quarter-hour display by four Beverley freighters, a half-dozen Westland-Sikorsky whirlwind and

(Continued on page 80)

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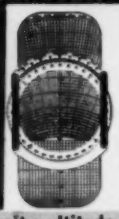

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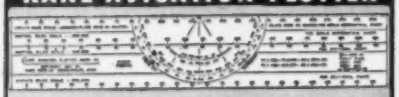

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(Continued from page 79)

two Belvedere helicopters, plus Pioneer and Twin-Pioneer STOL transports. Fighter Command provided top cover of eight Hunter FGA 9s for this operation, as well as the Hunters of No. 92 Squadron to take over "Treble One's" well-known display of formation aerobatics. Lightnings made their first squadron appearance from Farnborough, with the fiery afterburning takeoffs and close formation rolls and wingovers of No. 74 "Tiger" Squadron. An individual Lightning T.4 trainer flown by ace English Electric pilot Roland Beamont performed one of the most astonishing displays of sustained high-G turns yet seen. Seldom going outside the airfield perimeter, the Lightning was kicked round at apparently impossible turn rates by bursts of afterburning.

The Royal Navy played a big part in the program, with its Scimitars, Sea Vixens and Gannet AEW 3s, performing formation air drill, in-flight refueling demonstrations and carrier-type arrested landings with a new airfield gear, and an individual fly-by by a Blackburn Buccaneer. The Army Air Corps also was represented, with a lively Skeeter helicopter square-dance, as well as by the addition of its own parachutists to parallel a sky-diving display by the RAF. Six air force instructors marched arm-linked rearwards from a Beverley at 7,000 feet, and fell in a lump for nearly half a minute before separating and continuing in free fall, finally opening their parachutes for a spot-landing on the airfield.

Helicopters also were used for a novel display by the Westland Group, Britain's main rotorcraft company. A Gazelle-powered Wessex, in production for the Royal Navy, was used to pull along the runway a 50-ton load, which included one of the company's Scout helicopters and a Citroen van previously loaded by a Gnome-Whirlwind, as well as an armored car and several transport trailers. Among the Westland "circus" was the ex-Fairey Rotodyne, which has been flying in prototype form for some four years, and is now well developed, although no firm orders are yet forthcoming. Current development is directed mainly towards reduction of tip-burner noise.

Another now-familiar participant was the Short S.C.1 jet-lift research type, which has reduced VTOL operations to a matter of routine. No follow-up contract has yet been placed by the British Government for the important technical achievement represented by the S.C.1, which is now being developed, in conjunction with more advanced autostabilisation equipment, for automatic blind landings in its hover regime. The unrivalled experience gained by Shorts with the S.C.1 has been applied to a VTOL fighter project for the NATO competition, but in this, the Belfast design probably will have to compete initially with the second-phase Hawker P.1127 development to decide the official British entry.

The missile miscellany at Farnborough was dominated physically, if not technically, by a full-scale engineering mock-up of the de Havilland Blue Streak ex-ICBM, which now seems destined to remain Europe's main space probe, with a French Veronique second-stage rocket and a German (Bolkow) third stage. An all-British three-stage rocket was the solid-fuel Jaguar research vehicle, developed by the Weapons Research Establishment and R.A.E.

In the accessory field, the most impressive demonstration was undoubtedly the daily dummy ejection from the back of a stationery truck with the Martin-Baker zero-height, zero-speed rocket seat. This development adds a rocket unit to the standard ejection-seat to give it full survival capability from ground level and zero speed, or from low-altitude, low-speed aircraft in normally unfavorable ejection attitudes. The rocket seat is suited especially to VTOL aircraft, but also can be used at very high speeds. Apart from the reliability of the daily demonstration, its most impressive feature was the 300-foot high trajectory of the ejected mass, and the clean separation as the dummy was dragged from the seat by the drogue stream and parachute. END

Lycoming

(Continued from page 31)

be in trouble . . ." At one end of the plant is a sign that says, "Build every engine as if you were going to fly it yourself." This makes a fine display, but what counts is the man who inspects connecting rods day after day and keeps in his mind that a pilot will be depending on that Lycoming powerplant.

Finished and inspected, the parts funnel to the assembly line. Every engine is built around its crankshaft. In the space of an hour, the crankshaft takes about it a crankcase, flywheel, cylinders, and accessories (which Lycoming purchases complete from the manufacturer).

At various points along the line, gear reduction housing and superchargers are fastened in place. The engine is painted and baked; an ignition harness is fitted. It is test-run for four hours in one of the company's 14 test stands, and if it meets specifications, is sent to a packaging section for crating and shipment. Some 25 per cent of Lycoming engines, incidentally, are shipped overseas—either to foreign aircraft manufacturers or installed in American aircraft sold in other countries.

After the test run, one engine in nine is taken apart and checked for excessive wear or signs of internal malfunctions. If a discrepancy is found in one engine, the other eight of its lot also are disassembled and checked for the same malfunction. In one instance, an assembler caught himself installing a lock washer incorrectly, and thought that he had been making the mistake for some time. Because of this, 39 engines that he had worked on were torn down and inspected. He was wrong; all the other lock washers were properly installed.

Although some engines are picked from the line and run continuously for thousands of hours and some are run at full throttle for as much as 50 hours at a time, Lycoming engineers say that you can't really test an engine without actually installing it in an airplane. Heat, vibration, cowl and baffle design, and varying weather conditions of actual service constitute

(Continued on page 83)

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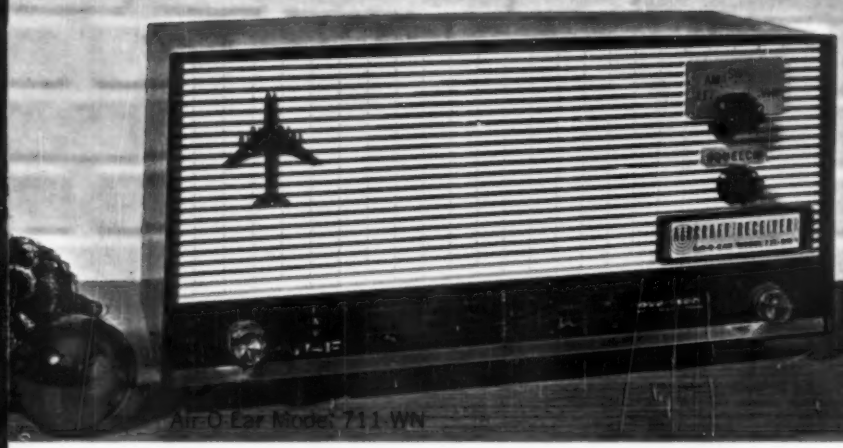

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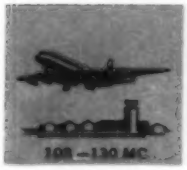

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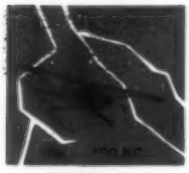

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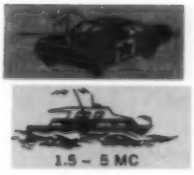

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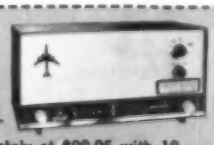

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(Continued from page 80)

the only real test of a powerplant.

Actual flight conditions have been testing Lycoming aircraft engines since 1928, when the company branched from auto engine manufacture to the design and manufacture of the 215-hp R680, a nine-cylinder radial engine that was in production for 20 years. In 1932 the company began a rather short-lived trend to large engines by introducing the 12-cylinder-opposed, 1,200-hp XO-1230. The trend was climaxed in World War II by the XR-7750, a 36-cylinder, 5,000- to 7,000-hp liquid-cooled radial that still stands as the largest piston engine ever built. It suffered the fate of a few other wartime projects, however, and was never fitted to an airplane.

The first glimmer of Lycoming's future came in 1938, when the company produced the O-145. This four-cylinder-opposed 75-hp engine powered many prewar airplanes, and was the powerplant used in America's first successful helicopter, the Sikorsky VS-300.

Lycoming's "family of engines" concept began to be a reality when the O-145 took on propeller reduction gearing to become the GO-145. In 1945, with Lycoming's GSO-580, general aviation had its first geared and supercharged opposed engine.

That "family of engines" concept is the single most important policy at Lycoming. Here one engine, like the 115-hp O-235, is parent to a complete line of engines through the addition of accessory features and by more cylinders of the same bore and stroke. The O-235 becomes the 260-hp O-435 when it takes on two more cylinders. It becomes the GO-435 with reduction gearing, the VO-435 when it is modified for vertical installation in helicopters.

The TVO-435 is a turbosupercharged version of the VO-435. Now installed in the Bell 47G-3B, this engine gives the helicopter full sea level performance to an altitude of 15,000 feet, and a service ceiling of 26,500 feet, a potential world helicopter altitude record. The '435 becomes an eight-cylinder 400-hp supercharged engine called the SO-580 when it takes on two more cylinders and a supercharger.

Every Piper airplane produced today flies with a Lycoming engine, from the Colt, powered by the 115-hp O-235, to the still-under-test Comanche 380, that is trying the eight-cylinder, fuel-injection 380-hp IO-720 for size.

The O-235 has been a very successful engine for Piper in the field, and its authorized overhaul life is now 800 hours with two 25 per cent extensions to 1,200 hours, if a thorough check of the engine does not show excessive wear.

More than half of the O-235s return to the factory with over 1,000 hours in their logs, and there have been some of these engines, operated at consistent low rpm, that have up to 2,000 flight hours before they are returned to the Lycoming plant.

At first, it was a different story with some of the company's high-compression engines. The early large powerplants had some piston ring breakage and excessive piston wear. The difficulties with the big engines, however, have been overcome in the last year through the use of nitrided, tapered cylinder barrels and four-ring pis-

(Continued on page 84)

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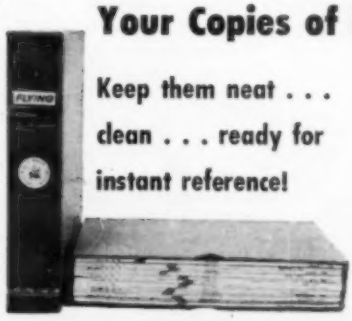

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(Continued from page 83)

tons. The high-compression problems stopped abruptly as the modified pistons and cylinders were introduced early in 1961. With one time-between-overhaul extension to 1,000 hours authorized, the big engines are beginning to rival the performance of the smaller, simpler Lycoming powerplants.

The Apache O-320 150- and 160-hp engines recently have been granted the same two-extension option that the small engines have, and the O-540s in the Piper 250 Comanche have been getting 1,100 hours between overhaul in Army single-engine instrument training (see FLYING, September '61).

Despite its comfortable position in the world of reciprocating engines, Lycoming feels that there is still room for advancement, and has a staff of more than 250 engineers at work on the development of the piston engine. The company points out that if there had been no Lycoming research and development, there would be no light geared or supercharged engines available today. Future plans call for an additional 550 to 650 engineers at the Williamsport plant. This drive for development is based on the principle voiced by C. H. Wiegman, chief engineer at the plant. "Theoretically," he said, "there is nothing to keep the piston engine from matching the turbine in power-to-weight ratio." Pursuing this end, Lycoming aims at reducing engine size through more efficient control of airflow through and over the engine.

There have been "many little breakthroughs" in place of a few major innovations at Lycoming. One of these lies with inertia supercharging, where a standard engine increases its horsepower through sophisticated airflow control. This is the feature that allows the inertia-supercharged, 205-hp IO-360 to produce 25 horsepower over than the basic IO-360. By "organpipe" tuning, a column of fuel-air surges back and forth in the precisely-engineered intake manifold, synchronized with the opening of each cylinder's intake valve. This tuning pushes more fuel-air into the cylinder, effectively supercharging it. In another development, by increasing the rpm of the IO-360 to 3,200, Lycoming engineers have produced a four-cylinder powerplant that packs 220 hp for Aerojet's SD-2 target drone.

Also under development in the Lycoming laboratories is a multifuel engine, planned for use in Army ground vehicles. An aluminum engine producing up to 250 hp, the multifuel is still too heavy for aircraft use, but development might one day find a similar engine, capable of operating on gasoline or kerosene or diesel oil or JP-4, ready for fitting in an airplane.

Though Lycoming Williamsport has gambled in the past when it brought gearing and supercharging hopefully to the market, it is now at the point where it can "stop producing brand new engines and just go on developing present ones." Some time ago, Lycoming studies into the field of turbines showed that it is possible to produce a reasonably good design for a small (300 shp) turbine, but that its cost (about $40 per hp compared to a piston's $15 per hp) would be prohibitive; the person with a requirement for a small engine would not be willing to pay so much money to get it. But the business of Lycoming overall is power, and the company's Stratford, Connecticut plant is engaged in production of larger (from 860 shp) turbine engines for military and civil use. Lycoming feels that 500-600 shp is the breakoff point between the realm of turbine and piston, and that that condition will remain in the foreseeable future.

Lycoming's key product is performance and reliability, which is reflected in the fact that Lycoming-powered aircraft hold 24 world records. Among these is Max Conrad's 7,688-mile 58.5-hour nonstop flight from Casablanca to Los Angeles in a Piper Comanche, powered by a 250-hp Lycoming O-540.

With the record that the Lycoming engine has set and its ability to accomplish its job safely and cheaply, it will be a long time before the engines built at Williamsport will be matched by any other form of aircraft power. END

Executive Fleets

(Continued from page 47)

stressed; airplane is capable of LABS maneuver.

The seven-eight place VIP jet can seat three people across (station-wagon arrangement). Maximum takeoff weight is 11,700 pounds, cruise speed is 500 mph, maximum operating altitude is specified as 45,000 feet.

Powerplants for the aircraft are two General Electric CJ610-2B turbines of 2,400 pounds thrust each.

Basic price, fly-away Switzerland, stated SAAC president William P. Lear, Sr., will be $250,000. Completely equipped, cost will approximate $350,000.

Cost of operation at 600 hour-per-year utilization, was specified as seven cents per seat mile. Self-contained aircraft allows for air conditioning without main engines running.

Piaggio-Douglas' PD-808, with maximum takeoff weight of 15,000 pounds, in high-density configuration will seat up to 10, including crew of two. Powerplants will be either the CJ610-1s of 2,850 pounds thrust each or two Bristol Siddeley Viper 20s of 3,000 pounds thrust each. Normal seven-place 500-mph aircraft is designed by Douglas; initially it will be produced at Piaggio's Italian plant.

The executive jet, also aimed at the military market, will sell for between $450,000-$500,000 fly-away Italy. Powerplants also are aft-fuselage mounted. Operating costs, stated Floyd C. Newton, Jr., Douglas Aircraft Co. project engineer, run about $100 per flight hour based on 600-hour annual time and best cruise of 500 mph.

Douglas retains world sales and service rights to the 808.

During the meet the NBAA awarded flight safety honors to 61 company or corporate member operators of business aircraft, plus 263 citations to pilot members. William T. Piper, Sr., president, Piper Aircraft Co., was presented with the NBAA award for Meritorious Service to Aviation. END

Art of Aerobatics

(Continued from page 41)

Charleston and get you to give me some instruction in aerobatics." Not long after, when he was leading the 1949 Thompson Trophy Race at Cleveland, he made too tight a turn in his modified P-51, flipped on his back and flew into a house upside down in a gradual dive. A proficient aerobatic pilot should have been able to recover easily from this attitude. I have much satisfaction and peace of mind in knowing that, no matter what attitude my aircraft gets into, I will be able to control it and still feel right at home. Aerobatics to a military pilot are extremely important because he frequently is called on to change the attitude of his aircraft in military maneuvers as well as in training. For the military pilot, the added speeds make familiarity with the airplane even more important.

One of the most unique developments has been the increase of interest among the military in civil aerobatic flying. At the moment I have seven exhibitions scheduled over the next few weeks and five are at Army, Navy and Air Force bases. Air shows for years either have been dominated by military flying or had a large portion of the program given to military flying. This still is true to a large extent and, of course, the tremendous exhibitions put on by the Navy Blue Angels, the Air Force Thunderbirds and a few other military teams are beautiful to watch. One reason that civilian air shows and aerobatics have again caught the imagination of the public is that the Air Force has continued to put more emphasis on the higher-speed airplanes and the unmanned aircraft. When the speeds of the aircraft get over 600-700 miles an hour, it is hard for the pilot to put on a demonstration that can be viewed by spectators at one point. The type of airplane that the civilian aerobatic pilot uses has a little more "personality" and, I believe, develops more spectator interest than a roaring, 700-miles-an-hour piece of metal.

The question often is asked, where can the average pilot get instruction in aerobatics? This question is difficult to answer, with the scarcity of good aerobatic airplanes in America and the fact that most of our modern airplanes are not built primarily for aerobatics. There still are, however, quite a few Stearman PT-17 biplanes and similar aircraft around that might be available either for aerobatic practice or instruction. If you can't find one of these in good condition, I recommend going to a good flying school and talking with the chief instructor about your desires to get aerobatic lessons. If you rent an airplane, a word of caution: be sure that the aircraft is well built and airworthy and that the owner knows you plan to practice aerobatics. Check the aerobatic aircraft thoroughly for loose objects and make certain that the oil and gas tank tops are in place. Empty seat belts should be secured and the entire fuselage of the airplane should be checked inside to make certain no loose objects will be flying around when the airplane is inverted. Wear a good parachute and don't fly upside down under 3,000 feet. If possible use two safety belts so that, if one comes loose, the other will

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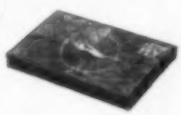

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hold you in. It's also a good idea to check your pockets for items that will fall out when the airplane is inverted. I have lost quite a few valuable objects over the years because of failure to do this.

Don't just get into the airplane and start practicing aerobatics. The key word is "planning." You must know what you are going to do and how if you are to to it well and safely. If you have had little or no aerobatic experience, develop one maneuver at a time until you can do it consistently well. Much time is saved in the air if you work out your maneuvers on the ground and mentally fly through every attitude that the plane will be in during a particular maneuver. If you have an airplane available to practice aerobatics but no qualified instructor, it is mandatory that you work out your maneuvers on paper beforehand if you expect to do any kind of a decent job. I might add that I never had a minute's instruction in aerobatics.

TO become a qualified, safe and effective aerobatic pilot takes many different ingredients along with experience and hard work. One of the saddest and, at times, most frightening things to witness is to see an inexperienced aerobatic pilot attempting to do low-level aerobatics. I can't think of anything more dangerous unless it's playing Russian roulette. Low-level aerobatics must necessarily be reserved for those pilots who can consistently perform their maneuvers in a safe manner at any altitude. The airplane must, of course, be equipped with an inverted system and be fully capable of doing difficult aerobatics. A double belt system is mandatory. In spite of this, I have seen many supposedly good aerobatic pilots perform at low levels with only one belt. How embarrassing it is when that belt comes undone while flying upside down close to the ground. The most graphic example that comes to mind is when Speed Holman was fatally injured in the late 20's when his belt came loose as he was flying upside down close to the ground in front of thousands of spectators.

Many pilots ask me how to start low-level aerobatics with safety. My answer always is: you must be able to accomplish 100 out of 100 slow rolls without gaining or losing altitude before attempting any low-level aerobatics. The slow roll or aileron roll is the most important basic aerobatic maneuver and should be perfected completely before attempting low-level aerobatics. The other two basic aerobatic maneuvers are the loop and snap roll. The loop is important to have perfected as the stick loads vary with airplanes depending on the design, attitudes and speeds of the plane. Before low-level loop maneuvers are attempted, it is extremely important to be thoroughly familiar with the inside loop and to be able to accomplish it on a consistent basis. I had the unpleasant experience many years ago of almost flying into the ground while attempting a loop at a low altitude. The airplane I had owned and used previously was a Travelaire 4,000 biplane which had almost-perfect elevator control. I could do loops right off the ground consistently and safely. I made the mistake of attempting this maneuver right on the ground just after I had purchased a J-5 Waco taper-wing and almost flew into the ground with the taper-wing because of a nose-heavy condition that developed coming down the back side of the loop. Experiences like this are to be avoided if an aspiring aerobatic pilot is going to enjoy success and long life. I simply was lucky.

All aerobatic demonstrations are variations of the slow roll, the snap roll and the loop. When more experience is gained there are maneuvers like the outside loop which, in a sense, is a basic maneuver except that the pilot must be fully proficient and have the best equipment to do an intricate maneuver of this kind. In my exhibitions there are five variations of the slow roll, 14 variations of the snap roll, including inverted snap rolls, and seven variations of the loop including square loops, outside loops and snaps in the top of loops.

I use a German-built Buecker Jungmeister which generally is considered to be the finest aerobatic airplane anywhere. It is a swept-wing biplane with an American Warner Super Scarab 185-horsepower engine. Originally the German engine was a Siemans SH-14A 160 hp engine. In addition to a double belt and inverted system, the Jungmeister has double ailerons and the pilot's seat is located near the c.g. which means that the pilot experiences fewer G forces. The Jungmeister's controls are effective and smooth. It is particularly maneuverable so far as aileron and snap maneuvers are concerned. The most intricate maneuvers can be accomplished in perfect fashion with comparative ease in this fine aircraft. Some of the maneuvers included in a regular exhibition are 4-point and 8-point sectional rolls, one-half snap, single snap, 1½ snap roll, double snap roll, 2½ snap rolls, 1½ snap rolls from knife flight, 1¾ snap rolls from knife flight, ¾ snap roll from knife flight, inverted snap roll, 1½ inverted snap roll, inside loop, single snap in the top of a loop, double snap in the top of a loop, square loop, outside loop, vertical eight which includes an inside and outside loop, vertical snap rolls with spin recovery, inverted ribbon pickup and inverted hands-off flight.

EVERY aerobatic exhibition, if to be worth watching, must have these five ingredients: good execution of maneuvers, proper placement of maneuvers, continuity, safety and showmanship. Placing maneuvers properly is the most difficult part because the performance must be executed directly in front of the spectators at the proper altitude if it is to be effective. Wind velocity and direction, the sun and other conditions invariably affect the placing of aerobatics. Going quickly and smoothly from one maneuver to another with good continuity requires planning and hard work. Safety must never be compromised and the performance must be presented with the proper degree of showmanship if it is to be interesting and successful. An exhibition that leaves out any one of these five ingredients has something lacking and needs improving. Another way of summing up these ingredients is to use the word "planning." They represent planning, practice and hard work for which there is simply no substitute.

A great deal of interest has developed in antique airplanes and antique flying over the past few years. Those who are in-

terested in purchasing a good aerobatic airplane should not make the mistake of thinking that every open-cockpit biplane is a good aerobatic airplane. It isn't. My advice would be to learn something about aerobatics before trying to pick out an aerobatic airplane. A good aerobatic plane does not make a good aerobatic pilot, even though many aerobatic enthusiasts have this impression. Reasonably good aerobatics can be accomplished in almost any well-built biplane and many of the slower monoplanes.

Sport enthusiasts, antique flyers, aerobatic pilots and aviation publications, can encourage safe and well-managed aerobatics. Good information on aerobatics is extremely important and should be dessiminated at every opportunity.

In 1950 I had the privilege of flying exhibitions in France and Germany where I observed European aerobatic pilots. I came away with definite impressions as to the difference in their styles and attitudes. Even though Europe has some outstanding aerobatic pilots, I'll put up our American professional aerobatic pilots against any of theirs. The American aerobatic pilot is more interested in safety than the European. The top American aerobatic flyers put more planning and spend more time developing their routines than the pilots I saw fly in Europe.

Our safety record on aerobatics, I believe, is considerably better than that of the European countries. The American pilot shows his airplane and his maneuvers in a little more interesting and effective way than the European pilots. Frank Price recently made some comparisons between European pilots and American aerobatic pilots when he returned from Czechoslovakia this spring. He agreed that Europe has some good aerobatic pilots but that their style and method of presenting their aerobatics is different from the best American aerobatic pilots.

Interest in air shows is again on the upgrade. If the sponsoring organizations, such as the American Legion, Kiwanis, Civil Air Patrol and Junior Chamber of Commerce and others will take time to produce legitimate and well-managed shows with top-grade performers, this interest will gain momentum and the sponsoring organizations will enjoy financial success. END

Shock Waves

(Continued from page 29)

same sort of hazard, but this clearly was not the case.

Even though most engineering authorities were convinced that the possibility of shock wave damage was very slight, even to the smallest aircraft, some lagging doubts remained. No one could say for sure that the shock wave fields in close to a supersonic airplane would not cause damage to other aircraft, light or heavy.

To answer these questions about the close-in shock fields, NASA conducted a series of experiments several months ago. In the first one, a DC-3 was placed in an isolated position on the dry lake at Edwards Air Force Base, California. Then a Republic F-105 fighter was flown 200 feet above the transport at supersonic speeds.

Shock waves from the fighter bounced the DC-3 around rather badly. The aircraft's skin appeared to deflect a large amount as the shock waves passed over it. Several structural questions were raised by these tests.

A second experiment was then planned to determine the magnitude of the structural stresses caused by the shock waves. Hundreds of tiny electric strain gages were cemented to the airplane. These gages can provide a picture of the stresses and strains in the structure at any given instant.

Again the F-105 was flown over the DC-3 at the same speed and altitude held in the previous test. Even though the transport jumped about and its skin rippled just as it had during the first test, the strain gages showed that very light structural stresses occurred. A number of flights were made to confirm this.

As far as lightplanes are concerned it was possible to use the stress information from the DC-3 to show that they would have been in no danger from the shock waves.

After the structural uncertainties were resolved, one major question remained. Would the shock wave forces which severely bounced the parked DC-3 make the airplane unmanageable during flight. NASA's next experiment provided the answer to this question.

(Continued on page 88)

Jules Manger, Jr., Chairman of the Board, Manger Hotels, is seen with his wife and two of their seven children, all ardent flying enthusiasts.

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(Continued from page 87)

It was reasoned that a momentary loss of control would be most serious during a landing, just as the flare-out was initiated. Therefore, several landings were timed so that the flare-out began just as the F-105 passed 200 feet above the DC-3 at supersonic speeds. The DC-3 pilot reported that there was a trim change but that it was very small, much smaller than the trim change occurring when the flaps are lowered on most airplanes. He also estimated that the vast majority of pilots would have been able to complete the landing if they had been struck by strong shock waves.

ONE note of caution was sounded for private flyers as a result of the NASA tests and some Air Force flight experience. Even though structural damage is not to be expected in a near-collision between a lightplane and a supersonic bomber or fighter, it is possible that the light aircraft's occupants will experience great consternation, dismay and even panic.

The intense noise created by shock waves close-in to a supersonic airplane resembles an explosion. Even if flying personnel have been briefed thoroughly on what to expect, an unanticipated shock wave "booming" during flight can be extremely unnerving. A case in point happened to a Boeing B-52 crew during a long training flight. Apparently, a supersonic airplane which they never saw passed within a few feet of their aircraft. To the B-52 personnel this near-miss appeared to cause a quick series of intense explosions. To a man their first reaction was that the B-52 was disintegrating and they should leave the aircraft immediately. After the first shock wore off, the commander decided that they should attempt an emergency landing. A check revealed that there had been no visible structural damage, but the crew was still uncertain as to just what had happened and what damage could have occurred. A thorough inspection after the emergency landing showed that there had been no damage at all.

This is an unusual example, but it shows what can happen to even the most experienced flyers. Most "booming" of aircraft occurs from a distance of several thousand feet and the noise inside the aircraft hit by the shock waves is relatively light, although it is frequently louder than the "booms" heard on the ground.

Several rules of thumb have grown out of shock wave noise and damage research in the last few years, which can help the average pilot understand the problem and predict how important it will be under various operating circumstances. In the first place a shock wave produces a very rapid pressure disturbance.

The pressure in front of the extremely thin wave is at the normal atmospheric level while the static pressure behind it is higher than normal. This shock wave over-pressure can be quite large. It exceeds the wind force in most hurricanes about 100 feet out from the supersonic airplane. In closer to the airplane the over-pressure is higher.

The sudden, heavy over-pressure, which strikes like a physical blow rather than a steady wind, is what causes the "boom" in human eardrums. It can also inflict heavy damage to stationary structures on the ground. The most common example of this damage, broken windows, has been widely publicized in U.S. newspapers. However, in most of these cases the "booming" aircraft was flying above 10,000 feet. The damage can be much more severe when the offending aircraft is flying low.

One of the most destructive incidences on record involved a USAF F-104 Starfighter which had been invited to put on an aerobatic exhibition at the Ottawa, Canada airport. During a practice run at the airport the day before the show, the pilot inadvertently let his aircraft exceed Mach 1 as he passed over the new administration building that was in the final stages of construction. Shock waves from the F-104 lifted the heavy, tar-like insulation and weather proofing layer completely off of the building's roof. When this layer fell back, it was disarranged and unusable. Virtually every window pane in the glass-front building was broken and the insulation was drawn out from around most of the window frames. In all, over half a million dollars' damage was done to the structure, which was scheduled to cost around $3 million when completed.

Fortunately, aircraft in flight or parked on the ramp are not firmly tied down and immobilized in the way that buildings are. If aircraft were rigidly restrained, they would suffer extreme damage from a near collision with a supersonic body. The ability to bounce around and give a little against the sudden pressure blast from a shock wave allows the airplane to remain undamaged.

Research has shown that several factors can influence the force of shock waves. The main factor that can reduce their force is altitude or air density. As the altitude increases and the air density decreases, shock wave strength decreases. Altitude is the greatest attenuator of shock waves, and as supersonic flight becomes more commonplace it is certain that there will be regulations to restrict it to altitudes above 40,000 feet or so. These regulations will reduce the possibility of noise complaints on the ground and damage to aircraft cruising at the lower altitudes.

THERE are three major ways that shock wave strength can be increased. Its strength can be doubled during maneuvers. For instance, during a supersonic turn the shock waves on the inside of the turn tend to become focused on a particular point and the pressure at that point will rise to about twice its normal value. To counteract this focusing phenomenon there probably will be regulations about maneuvering at supersonic speeds above heavily populated areas.

The last two factors which influence shock wave force are the two which will cause the most trouble in the future. Increasing supersonic speed to Mach 3 and building larger, heavier aircraft such as the B-70 and the supersonic transport will cause a major increase in shock wave strength. Both of these aircraft will weigh at least twice as much as the 200,000-pound B-58 which is the largest supersonic airplane now flying. While no one can say for certain just how strong their shock waves will be, it is estimated by

most authorities that they will have to cruise at 70,000 feet or above. If they fly at lower altitudes, many theorists predict that they will break windows all along their flight path. Even at 70,000 feet the B-70 and supersonic transport will probably sound like thunder as they pass overhead.

These two airplanes of the future undoubtedly would present a much greater hazard to lightplanes than the supersonic airplanes now flying. It is possible that they could cause structural damage if they passed within 1,000 feet of a light aircraft. Both the damage and noise questions still are unanswered for the most part, however, and a large amount of research is scheduled during the next couple of years to provide a solid understanding of these problems. The research will be conducted primarily by the Federal Aviation Agency and the NASA.

While the shock wave damage potential of the B-70 and the supersonic transport cannot be predicted accurately today, one area in which they will be an extreme hazard has been clearly defined. The vortices trailing behind these aircraft will be stronger and more dangerous than those from any aircraft ever operated.

Well-proven and accurate mathematical means are available to predict the strength of the vortices behind any type of wing. According to these theories the B-70 wing, because of its short span, will produce two exceptionally strong vortex trails.

The trails would be strong enough to cause structural failure to a 400 mph transport that flew directly across them. Lightplanes, which can be severely damaged by the wake from a subsonic jet transport, would be in even more jeopardy if they cross behind an airplane like the B-70 while it was climbing or descending.

Most lightplane pilots do not have to be encouraged to stay away from large airplanes. But many aviation experts believe that tighter air traffic control will be needed to positively separate future supersonic transport from all other aircraft. The research of the next few years is intended to determine exactly what hazards the new airplanes present and what type of new controls will be required. END

Super Broussard

(Continued from page 33)

The low pressure tires (46 pounds per square inch) protrude slightly below the fuselage (4.7 inches) when retracted. A cabin air-conditioning unit is located in the right-side gear fairing.

The squarish, blocky fuselage of the MH-260 is supported in flight by a high cantilever wing. Fail-safe principles have been employed throughout the construction, which is all metal with the exception of the fabric-covered control surfaces. A careful inspection of these latter is rendered difficult by their height above the ground (10 feet), but this also has the advantage of raising turbine inlets and tail surfaces above the danger of flying stones and debris on unpaved runways. A large baggage compartment (140 cubic feet) is located at the rear of the fuselage.

A small three-step ladder, easily portable in the plane, is necessary to climb

(Continued on page 90)

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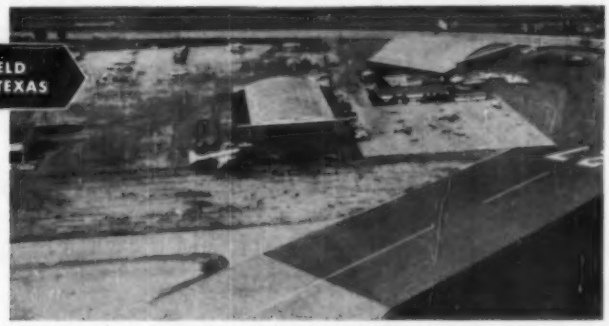

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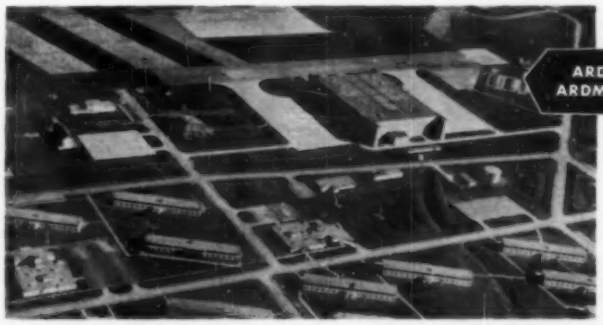

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(Continued from page 89)

into the very spacious cabin (21 feet by seven feet by six feet). A single standard passenger door is provided which in view of the cargo mission seems inadequate. The cabin accommodations are quite flexible. Up to 23 passenger seats can be fitted, and an easily removable bulkhead is provided for any desired combination of passengers and freight. When cargo alone is hauled, the maximum payload is 8,565 pounds over a range of 225 miles; maximum range for the cargo version is 940 miles with a payload of 6,040 pounds. A lavoratory and cloakroom are installed at the rear of the cabin.

The Super Broussard's cockpit has been designed so that all controls, switches, and gauges are accessible from the left seat. A second crew member serves as copilot and and flight engineer. As we strapped in, Jouannet explained the very simple autostarting procedure: throttle is advanced until a green light winks on indicating that circuits are in order; the starter button is then pushed. The starter-dynamo cuts out as rpm rises through 45 per cent.

The flight deck of the MH-260 is well laid-out and uncluttered. Throttles and pitch control levers are on the left side, with radio gear in the center. Piston-engine pilots should have no difficulty in becoming accustomed to the turboprop instrumentation. Seven minutes after starting up we were at the end of Melun-Villaroche North-South runway calling for takeoff clearance. The weather was hot and calm: 85 degrees F., no wind. Our takeoff weight was 19,500 pounds, one ton below maximum allowable.

For takeoff, with flaps at seven degrees, both throttles and pitch levers are placed full forward. The two 986 ehp Bastans accelerated rapidly to full power (33,500 turbine rpm and 500 degrees C. TPT). At 100 knots the aircraft was still on the runway. Jouannet said "Horse back on the yoke". This done, the Super Broussard leaped into the air and climbed steeply from the runway.

Climbing easily at 110 knots and 1,300 fpm, the MH-260 reached 6,000 feet in four and a half minutes. During this time, two apparent shortcomings became evident. Engine noise in the cabin is excessively high, and cockpit ventilation is insufficient to keep the crew comfortable on hot days. Solution of both problems is expected before the first production model leaves the factory in October 1961. Performance-wise, there is little to complain about the MH-260. It is a beautifully balanced and stable aircraft in all configurations and speeds. Control response is immediate and positive without being in the slightest over-sensitive. Rudder control is strong enough to effect 30-degree bank turns with rudder alone.

Single-engine performance is no less satisfactory. With the right engine feathered, we climbed at 90 knots and 300 fpm. Cruise speed in this configuration is 140 knots. To demonstrate the gentle control reactions of the aircraft, one throttle was pulled at takeoff power, with seven degrees of flap. Yaw was much less rapid than expected, and easily controlled. Flight control displacement indications, installed as test equipment, indicated that eight and one half degrees of rudder was used out of 10 degrees that were available.

Returning to the field to shoot a few landings, Jouannet explained the feathering capabilities of the Bastan unit with its Ratier-Figeac three-bladed propeller. Automatic feathering is provided by three pitot tubes, one on top of the cabin and one on each wing mounted behind the propellor. If the pressure differential between them drops to zero, the dead engine is feathered by an automatic device. Manual feathering is also available through pushbuttons located on the flight deck behind the throttles. After a normal approach and landing, a second approach was made with Jouannet at the controls. At 300 feet and 105 knots, gear and flaps down, the left throttle was pulled. Sinking was negligible as the right-hand Bastan took up the load. A single-engine go-around and pattern was flown. Rudder was ample at all times with no more than eight degrees being necessary. This pattern was flown at 100 knots. Following this a third approach was made, this time for a short-field landing. Milking the flaps down from half to full, we touched down at 75 knots. Ground roll was 850 feet, with some aerodynamic braking provided as propellers were pulled back to zero pitch. An automatic limiting circuit keyed to the landing gear oleos prevents the props from coming back to zero pitch in flight.

With 300 hours of flight accomplished, the Super Broussard is rapidly nearing the status of a fully-developed production aircraft. The first production model, off the lines in October, is expected to be delivered in January 1962. French certification is expected very shortly, and an FAA ticket will probably follow within a few months time. The Bastan IV turboprops are currently good for 800 hours

MH-260 SUPER BROUSSARD

Specifications:

Wing span	71 ft. 11 in.
Length	57 ft. 9 in.
Height	21 ft. 7 in.
Cabin:	
Length	21 ft. 4 in.
Width	7 ft. 2 in.
Height	5 ft. 11 in.
Gross weight	20,723 lb.
Empty weight	12,345 lb.
Fuel capacity	440 Imp. gal.

Performance (at 18,100 lb.):

Cruising speed (TAS at 10,000 ft., 75 per cent power)	236 mph
Stall speed (flaps down)	56 mph
Sea level rate of climb:	
Twin engine	1,670 fpm
Single engine	395 fpm
Service ceiling:	
Twin engine	26,500 ft.
Single engine	8,200 ft.
Takeoff distance (50 ft. obstacle)	1,295 ft.
Landing distance (50 ft. obstacle)	1,280 ft.
Range:	
Maximum fuel	930 miles
Maximum payload	500 miles

between overhauls, but this is expected to be raised to 1,000 hours by the end of the year.

The quoted price of $295,000 for the Super Broussard includes only the minimum amount of equipment necessary for flight. All radio equipment, cabin furnishings, and even co-pilot's flight controls are extra. A utility space of some 131 cubic feet for radio-navigation equipment and galley is provided for between cockpit and cabin. The MH-262, a pressurized version of the Super Broussard selling for $325,000, will begin flight tests in 1962 and be ready for delivery in 1963.

Arrangements to market the Super Broussard in the United States are still indefinite. Cessna purchased a 49 per cent interest in the Société des Avions Max Holste last year, and should a strong interest develop they will probably take part in selling the MH-260. It would appear however that the Super Broussard's future lies in the under-developed areas of the world. Designed as a backwoods airplane, it is ideally suited to conditions in Africa and parts of South America. Operators in Canada and Alaska may also come to appreciate the practical qualities of this roomy and highly perfected transport. END

Nomad

(Continued from page 27)

desired heading with very little tendency to drop out even though airspeed was about 110 knots IAS.

Normal Immelmann was done also, and again, without pulling excess Gs on the upswing, the Nomad flies smoothly out of the top roll without dropout or heavy torque effect. All maneuvers were done starting about 12,000 feet msl, over the Pacific Ocean.

In one vertical twist, 4Gs were pulled through the initial pullup to the vertical, relaxed through the 90-degree turn in the vertical attitude, then resumed in the half-roll, over-the-top pullout. The maneuver was started at 220 knots IAS, and recovery effected at 95 knots IAS, a respectable showing considering the speed loss usually caused by sustained high G.

Throughout all maneuvers, Nomad's control forces remained low, though not so light that overcontrol became a problem.

Speed tests at various altitudes and power settings showed the Nomad off to good advantage—at 5,000 feet msl, temperature of 26 C and 36 inches Manifold Pressure and 2,400 rpm, Blackbird registered 210 knots IAS, for a 235-knot or 261-mph TAS. At 5,400 feet msl, 27 C, using 29.5 inches mp and 2,100 rpm, aircraft indicated 194 knots, for a 219-knot or 253 mph TAS.

At 7,000 feet msl, using 24 inches mp, 2,150 rpm, a low cruise power setting, Blackbird registered 165 knots IAS which, corrected for the 23 C temperature, gave a 194 knots or 219 mph TAS. At this setting, fuel consumption registered 230 pounds per hour or 37 gallons per hour or, if you will, about 5.9 miles per gallon, almost as good a mileage as that of a car with automatic transmission.

Using high cruise power of 36 inches mp and 2,500 rpm, the Nomad was lifted from 7,000 feet to 12,000 feet msl, at 2,000

(Continued on page 92)

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T-28, TRAINER TO FIGHTER

OFTEN IN HISTORY, combat aircraft have become trainers in their old age, but seldom is the procedure reversed by a trainer in its dotage turning into a highly capable combat plane.

The reverse has been accomplished by the North American T-28 which, after being almost completely retired from the training mission by USAF, came back to assume the role of a tactical close support airplane with the French forces fighting in Algeria.

And the desert fighting in tricolor markings may be only the beginning for similar parts to be played by the aircraft in various parts of the world where brush fire wars may start, for the craft's proficiency makes it attractive to many air forces.

The metamorphosis was not a single stage affair—a number of intermediate steps were required to change the mothballed trainer into a combat-proved weapon.

The sequence of the T-28 saga went something like this:

- The original design was a trainer for USAF which had an 800-hp Wright R1300-A1 engine, grossed 8,000 pounds and was not a really inspired performer.
- The Navy ordered a T-28B which used a 1,425-hp R1820-86 engine, which made a real going concern of the aircraft. Navy also has a T-28C which incorporates a tail hook for carrier work.
- A civilian named Frank Crawford had in the late 1950s what was a T-28A and saw the possibilities for a conversion. Crawford interested both Pacific Airmotive Corporation of Burbank, Calif. and North American Aviation Inc. in the project, and wound up with one civilian, certificated airplane, the T-28 Nomad, holding FAA Type Certificate 1A18 dated July 29, 1960.
- The Nomad evolved into two versions, the certificated civilian model with 1,300 hp. designated Mark I, and a Mark II model which uses the 1,425-hp engine and has not been certificated as a civilian airplane.
- The original certificated Nomad, while a civilian airplane, retained its provisions for external military stores of various kinds, and was shipped to Algeria and demonstrated for a combat mission. The French quickly accepted it as a close tactical support airplane. In this role, the French named the airplane "Fennec," after a small Algerian fox.
- The French ordered 192 airplanes in the Nomad Mark I configuration which had been demonstrated to them, and the T-28 began its role as a combat plane.

(Continued from page 91)

fpm climb rate, with a 600 pound per hour fuel consumption.

Nomad stall characteristics are excellent—there is ample buffet prior to actual loss of lift, and the break is clean, in all configurations and entries. If the airplane is stalled power-off, in landing configuration, with a fairly flat attitude, it can be flown to and through the break and with full elevator displacement, on into a descent in the same attitude. Initial stall break and loss of lift does not produce a severe pitch-down if proper control is applied with a very gentle hand, and the secondary stall recovery sequence remains a slight buck and pitch as the airplane descends. The Blackbird was allowed to fly down about 1,000 feet before a wing finally dropped and normal stall recovery was effected.

Performing a high rate descent at low airspeed, the Nomad was put into landing configuration, airspeed held to 103 knots IAS and the airplane dropped at a 2,250 fpm descent rate.

One ILS approach was made at Burbank, with gear down and approach flap setting, holding 120 knots IAS airspeed. Throughout the 11-mile-plus descent down the Burbank glideslope, Nomad's excellent trim characteristics and stability showed to good advantage through the high turbulence which occurs on a hot afternoon in this area.

Nomad's landing characteristics are very good and completely straightforward. Over-the-fence speed usually is about 100 knots and is power cut as the flare is initiated. Blackbird settled onto the runway smoothly, with little tendency to bounce.

Steerable nose wheel and good brakes make taxiing the Nomad very simple, an excellent carryover from the basic mission of a trainer.

Features of the T-28 which boost utility of the Nomad include a large baggage compartment, accessible through a hatch in the belly just aft the wing trailing edge. Large size of the hatch and compartment allows items of reasonable bulk to be loaded and carried in Nomad, larger than usually expected for an airplane of this type.

The same hatch allows access to the radio rack, located aft of the cargo compartment and easily reached for maintenance or replacement.

Access to the powerplant is gained by unlatching and lifting the three-section cowling. Sections can be opened separately, or all together, without removing the cowl. Access to the aft side of the power package is gained by a hatch in the forward wall of the nose wheel compartment.

USAF has finished what phasing out of the T-28s it had planned and is storing them at Tuscon, Ariz., while the Navy has firm plans for its T-28Bs and Cs up through 1965.

Supply of T-28s for conversion comes from the Air Force stockpile. In the past, airplanes were bought singly and in lots by whomever wanted them, but USAF now is moving slowly and not selling any more as the airplane's new career shapes up, and foreign governments become interested in the tactical version. END

I Learned About Flying

(Continued from page 50)

satisfactory?" I had been on my full tank since the last landing and now was going back to a partially full tank. The gauge read half full so I should be all right.

The engine had slowed to 2100 but was still pounding. In leveling off, I had picked up some speed and at least I was able to maintain altitude. Gingerly I tried a shallow left bank, which would bring me in over the flats as I looked around for a suitable place to bring her in.

I was skimming the flats now at around 50 feet. The turn had been satisfactory and a slight reduction in power had smoothed the engine somewhat, so that it began to appear as though it might at least keep running. "1800 rpm! If I can only hang on to my altitude!"

No landings sites were at hand other than the strip from which I had just come. I thought of the numerous reports of fatal stalls occurring when the pilot had attempted to return to a field after power failure on takeoff, but I finally decided to keep on going and try for the field. By maintaining my shallow bank I would eventually come around to the field again, and if the engine did shut down I could always go straight in, in the direction I was pointed. One spot in that boggy mess was as good as any other.

After an eternity the strip appeared dead ahead and I eased in for my second landing at Graveyard. By this time the name

(Continued on page 94)

FLYING CALENDAR

December 5—National Air Taxi Conference, eleventh annual meeting, Statler-Hilton Hotel, Washington, D.C.

December 5-7—National Aviation Trades Assn. annual convention, Statler Hilton Hotel, Washington, D.C.

December 16—Dinner commemorating the Wright Brothers' Historical Flight, at Pottstown Elks. Sponsored by Pottstown Aircraft Owners & Pilots, Inc. Speaker: Paul Garber, head curator, National Air Museum, Smithsonian Institution. Contact Alvin E. Renninger, president, P.O. Box 225, Pottstown, Pa.

December 17—Third Annual Wright Brothers Flight, sponsored by Pottstown Aircraft Owners & Pilots. Contact Alvin E. Renninger.

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had assumed a certain grim appropriateness in my mind. The next thing was to find out what was wrong. Carburetor ice? Water? Ignition wiring? What?

Take the first. I *had* slighted carburetor heat prior to takeoff and here I was sitting at the edge of the ocean. But why so rough? I climbed out and checked the ignition wiring thoroughly. All spark plug leads were clean and tight. Then I checked all sumps for water. Still nothing wrong. Finally I re-started the engine and pulled carburetor heat for a suitably long time. It ran smoothly. Check mags. Still OK, so I convinced myself that whatever had been wrong was now all right. After all, it had smoothed out completely just as I was landing. I'll get it checked thoroughly in Naknek when I get back I thought.

With a certain amount of nagging apprehension I eased the throttle forward, and once more One-Six-Bravo roared down the field. Just as I broke ground the engine began misbehaving again. "Too late! I can't stop now," I thought as I hurtled over the end of the strip on my way to sea.

Again I went through a couple of harrowing minutes as I hursed the sputtering ship back to the field. Once again, that wonderful feeling of good solid land under the wheels. Now, what in the world was wrong?

This time Rasmus met me when I climbed out of the plane. "That engine sure sounds rough," he commented. "I didn't know if you were going to get back here or not. What seems to be wrong?"

I recounted my adventures and reactions. Rasmus asked, "Did you switch mags in the air?" "No I hadn't," I replied. "What good would that do?"

Then and there I learned a little more about flying.

"Well," said Rasmus, "the engine was missing and backfiring a lot, but it didn't stop. That rules out carburetor ice and/or water because they don't act that way. At low speeds it ran smoothly so that would indicate ignition problems to me. Since you've already checked the wiring, I'd suspect the plugs. When was the last time you cleaned and re-gapped them?"

I explained that it had been done during the last annual, about 60 hours previously.

"The ground check of the mags is a good check," said Rasmus, "but often the plugs won't misbehave until operating under full power and load. In an emergency, by switching to each mag separately you may be able to isolate the set of plugs that are worst fouled and then run satisfactorily on only the other set. At the same time you could also improve the smoothness if it happened to be a malfunction in one of the mags. In this case I'd suspect plugs, as 60 hours is a long time to go without checking them."

I felt pretty stupid by then. It should have occurred to me before. Someplace in the dim past I remembered an instructor who had drilled me in the mechanical process of switching mags to locate troubles, but for some reason the thought had never occurred that it might fly *better* on only one mag.

Since Rasmus had to leave, he brought me some tools and I was soon engaged in pulling all of the plugs and cleaning them. The first plug I removed was crammed with lead deposits, and all of the rest were fouled to some degree. After a half hour or so of careful scraping and prying with a penknife and bent wire, all plugs were relatively clean and ready to go back in the engine. When the cowling was back in place I started the engine and it purred smoothly.

This was nothing new. The trouble always occurred at maximum power. Well, to heck with the sand and dust. Locking the brakes, I revved the engine as high as possible . . . and it responded smoothly throughout. Finally I taxied out for my third try of the afternoon.

It was with real trepidation that I advanced the throttle and began moving down the field. I don't believe I breathed at all until I attained six or seven hundred feet of altitude and had leveled out for the return trip home. The next five minutes were spent with a critical ear tuned for the slightest hesitation or miss on the part of the engine, but it purred along with the utmost smoothness. I finally relaxed when the gear touched the Naknek airstrip.

One-Six-Bravo didn't move again until a complete set of new plugs had been installed. Since that time I've considered sparkplug maintenance among the more important items in the upkeep of my plane. And I also have reinstated a meaningful magneto check in my emergency procedure. END

CAP SOARING CAMP

THE NATIONALLY KNOWN soaring site of Harris Hill at Elmira, N.Y. was invaded recently by teenagers eager to gain firsthand knowledge of the art of sailplaning. There were 24; among them were nine Air Explorers of the 90th Air Explorer Squadron of New City, N.Y.; 14 CAP cadets of New York and Pennsylvania wings, and one Eagle Scout.

They came to Elmira to participate in the five-day "Introduction to Soaring" program at the Schweizer Soaring School.

The program's goal was limited to introducing the participants to the care of gliders and to soaring flight. The program did not intend to teach the participants to fly. Each day the cadets and explorers were subjected to several classes. Schweizer Aircraft Corp., FAA, Cornell University, and program staff personnel covered the salient points of sailplane design, construction, and utilization; CAR's; meteorology; aerodynamics; history of soaring; and national and international competition. Each participant made at least one dual flight per day in the school's 2-22C sailplane.

On the last day of the program, instructor Walt Cannon turned CAP cadet Alfred Wilbur (above) of Troy, N.Y. loose in the 2-22. Wilbur couldn't have equaled that ear-to-ear smile when he soloed a powered airplane some 40 flying hours earlier. He was the only participant to solo only because the program ran out of time. Another one or two could have soloed after a few more dual flights.

At the end of the encampment the program had accumulated 120 flights and about 20 hours of flying time. Each participant had received five flights amounting to about 50 minutes of flying, and covered some 15 subjects in class-room and field lectures. Twenty-one of the 24 had passed the pre-solo CAR exam and one had soloed in a glider. The program's and Schweizer's staffs were completely exhausted.

The program was originated by Richard Nelson of Pearl River, N.Y. with the cooperation of the Schweizer Aircraft Corp., Elmira, N.Y. The cost per participant of $79.50 included all lodging, meals, books, ground instruction, flying, and transportation between Harris Hill and Schweizer.

To the best of our knowledge, this program and its 1960 predecessor are the first week-long soaring courses to be offered to American youth.

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BRIEFINGS...

(Continued from page 8)

p.m. The cost is $10. Richard D. Raymond of Wayne, Pa., instructor, planned the course to bridge the gap between those interested in flying and those actually flying. An ex-Navy fighter pilot, Raymond is now an instrument-rated commercial pilot.

Cessna Skynight, first of Cessna's new 1962 models to be introduced and first one to be delivered to Business Wings, the firm's Dallas (Tex.) distributor, made its delivery flight a mission of mercy for the victims of Hurricane Carla. The plane's cargo consisted of clothing and canned

goods, donated by the citizens of Wichita, Kan. through an appeal by Wichita Radio Station KIRL, for distribution in Dallas by the Salvation Army. Loading the supplies are Capt. Bruce Tekautz, Wichita Salvation Army, and pilot Jerry Mann.

The Flying Physicians and National Pilots Associations have named Dr. William Requarth and N. O. Brantly as their respective "man of the year". Dr. Requarth, a founder-member and director of FPA was cited by his organization for his outstanding contribution to general aviation in the preceding year. Associate professor of surgery at the University of Illinois, Dr. Requarth is also president of NPA and chairman of the General Aviation Council. N. O. Brantly, president of Brantly Helicopters, was honored by NPA for his pioneer work in instrument and thunderstorm flying as well as his development of the Brantly low-cost helicopter.

Commercial and private plane owners may now take advantage of a low-cost powerplant lubricating oil examination which is reported to pinpoint excessive engine wear and forewarn of possible breakdowns. Labeled "Spectra-Check" and developed by the Cleveland Technical Center, wholly-owned subsidiary of the New York Central Railroad, Cleveland, Ohio, the program calls for submission of samples of a plane's engine oil to the Center. There a team of trained experts conduct an exhaustive examination and report their analysis to the aircraft owner.

By a pooling of resources, four surplus aircraft sales and service companies—Charlotte Aircraft Corp., Charlotte, N.C.; Aerodex, Inc., Florida Aircraft Radio & Marine, and Propeller Service of Miami, Fla.—recently came out on top, over stiff competition, with a contract for 95 aircraft for the Spanish Government. Dollar value of the package deal is about $6 million plus additional unnamed sum in services. Five C-54s, 60 AT-6s and 30 C-47s are included in the deal. Jenks Caldwell, president of Charlotte Aircraft, headed the American group. Gen. Antonio Nunez, Spain's chief of materiel and supply, represented his government.

New direction finding equipment utilizing a Doppler principle and covering both VHF and UHF bands will be installed in the coming months in selected FAA Flight Service Stations and airport control towers which are not equipped with radar. FAA has placed an order for 100 direction finders with Servo Corp. of America, Hicksville, N.Y. at a cost of $1,733,892.

1961 edition of the Helicopter Council's state directory of heliports and helistops in the U.S., Canada and Puerto Rico, lists 486 now in operation with 16 facilities proposed—an increase of 160 over the 1960 total of 327. In addition, the survey showed that approximately 100 oil rigs in the Gulf of Mexico are equipped with helistops. The directory is available gratis from The Helicopter Council, Aerospace Industries Assn., 610 Shoreham Bldg., Washington 5, D.C.

Orders amounting to $625,000 for the manufacture and delivery of 25 Fletcher FU-24 Utility aircraft recently have been submitted to the El Monte, Calif. firm by New Zealand aircraft distributors. A division of A. J. Industries, Inc., Fletcher Aviation already in the past five years has built a total of 125 of these airplanes and an equivalent of 30 planes in spare parts for shipment to New Zealand.

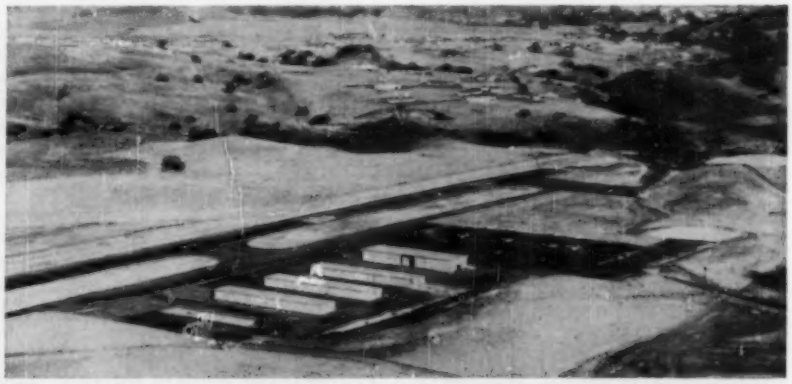
Construction of a $500,000 modern flight service facility for AirKaman, Inc., fixed base operator at Bradley Field, Windsor Locks, Conn., now at the half-way mark, is scheduled for completion around March 1, 1962. In addition the parent corporation, Kaman Aircraft, has leased 180,000 square feet of state-owned hangar, shop and office space at Bradley Field to which it plans to transfer production of its Navy HU2K-1 Seasprite utility helicopter from the main plant at Bloomfield, Conn. Some of this space also will be allocated to AirKaman, Inc. Kaman has recently been granted a $2,125,000 loan by the Connecticut General Life Insurance Co.

Auxiliary equipment aboard passenger-carrying aircraft rarely includes a piano, as is the case in this executive-type DC-4, one of a fleet of four airplanes which the Hacienda Hotel in Las Vegas, Nev. owns and operates on its "Champagne Flights" round-trip from seven California cities. A

permanent fixture in the DC-4, the piano provides music for the song fests staged en route by the passengers, all of whom are traveling free as guests of the hotel for a "Night in Las Vegas." A Lockheed Constellation and two DC-3s make up the rest of the hotel fleet, which in 1960 alone transported 150,000 Hacienda guests.

Doubling of the warranty life on its entire line of 1962 airplanes to six months was announced by Cessna Aircraft at recent NBAA meeting in Tulsa, Okla. A new world altitude record of 32,000 feet was claimed on October 18 for Kaman's H-43B medium weight helicopter. The pilot was Air Force Lt. Col. Francis M. Carney of Stead AFB, Nevada. The previous record of 29,846 feet was also set by the H-43B, on Dec. 9, 1959.

1961 Wright Memorial Trophy goes to Senator A. S. Mike Monroney (D-Okla.) for his "dedication to the advancement of aviation safety and equitable regulations in aviation over 22 years." Senator Monroney is 'a veteran pilot, author of the Federal Aviation Act and chairman of the U.S. Senate Aviation Subcommittee. The award will be presented by the National Aeronautics Association at the Aero Club of Washington's annual Wright Day dinner, December 17, 1961.



RANCHO CONEJO—One of Southern California's best-equipped General Aviation airports, Rancho Conejo, near Thousand Oaks, opened for business a few weeks ago. Operated by Aviation Services, Inc., Beechcraft dealers at Oxnard-Ventura County Airport, this new facility offers a 4,300-foot, hard-surface lighted runway NW-SE; 23 T-hangars; tie-downs for about 150 aircraft and full sales, service, maintenance. Transient pilots are promised top-notch attention.

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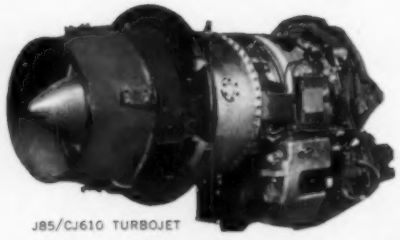

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GENERAL ELECTRIC

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CURRENT PERIODICAL SERIES

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